

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

1.6
So3S
v.26
Aug.1960-
July 1961

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL
CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF
AGRICULTURE-WASHINGTON

VOLUME XXVI

22

AD-33 Bookplate
(5-61)

UNITED STATES
DEPARTMENT OF AGRICULTURE
LIBRARY



BOOK NUMBER 1.6
984925 So3S
v.26
Aug. 1960-
July 1961

1.6

S035

V.26

aug 1960 -

July 1961

SOIL CONSERVATION

95
Index

VOLUME XXVI

August 1960 to July 1961



U.S. DEPT. OF AGRICULTURE
LIBRARY
FEB 13 1962
CURRENT SERIAL RECORDS

UNITED STATES DEPARTMENT OF AGRICULTURE

Issued November 1961

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL CONSERVATION—INDEX TO VOLUME XXVI

AUGUST 1960 TO JULY 1961

ACPS cost-sharing aid—	Page	ANDREWS, R. G.: Hydrologists Keep Track of	Page
channel improvement (Calif.)	211	the Water	285-286
dam building (Idaho)	214	ARCHER, SELLERS: Flood Problems on Florida	
drainage (S.C.)	71	Flatlands	201-203
irrigation improvements (Idaho)	129	Arizona, Coconino County, wheatgrasses do a	
liming acid soils (Mich.)	14	job	237-239
mountain meadow renovation (Calif.)	128	Arkansas Farmers Like Sericea Lespedeza.	
pond construction (Idaho)	30	Wilson W. Ferguson	233-234
range improvement (Idaho)	136	ARS—	
rangeland seeding (Okla.)	88	and SCS Use Portable Hydraulic Channel	80-81
seed harvesting (Okla.)	18	cooperates in river basin surveys	164
terracing, pond construction, tree planting		gives radiological monitoring training	159
(S.C.)	5	helps devise improved drainage pattern	278-279
tile drainage (Wash.)	287	need for devising improvements faster	75
tree seeding by helicopter (Wash.)	92	research. See Research Series.	
water development (N. Mex.)	10	ASHBAUGH, BYRON L.—	
wildlife improvement (Kans.)	187	receives Conservation Education award	251
ADLER, RUDOLPH: The Soil and Its Fertility.		Things To Do in Science and Conservation.	
With Henry Teuscher and Jerome P. Seaton.		With Muriel Beuschlein. Review	192
Review	95-96	Award(s)—	
AGNEW, LARKIN B.—		Conservation Education, presentation	251
How To Install a Pipe Overfall	40-41	Outstanding Conservation Farmer	24, 166
New Water Management System	278-279	to SCS employees, 1960	187, 192
Agnew, W. M., harvests catfish from stockwater		BAKER, EARL R.: Cranberry Production in	
pond	189-190	the Pacific Northwest	54-56
Agronomy, progress report	160	Balmforth, Sid, master pond builder	29-30
Airplanes—		Banker(s)—	
fertilizing floodwater-retarding structures with		Awards program initiated by F. S. Hurd	70
(La.)	213	Back SCD All the Way	263
tree seeding by helicopter (Wash.)	91-92	view of conservation plans	148
Alabama—		Barby, Ralph, builds conservation ranch	86-88
Greene County, beaver pond grows duck		Barclay, Judson, Jr., brings more wildlife to his	
food	182-183	ranch	187-188
parallel terracing	269	BARNARD, JOHN W.: review of Land for the	
Alfalfa—		Future	143
and grasses recondition land, increase hay		BARNETT, A. P.: Erosion on Piedmont Soils.	
yields	27, 111-112	With B. H. Hendrickson	31-34
weed control in	22	BEARD, JOHN C.: 5,629 Cooperators	65-66
ALLRED, B. W.: review of—		BEATY, ALFRED E.: review of Things To Do in	
Adventures in Ecology	96	Science and Conservation	192
Private Grazing and Public Lands	239-240	BENNETT, HUGH HAMMOND—	
ALTHOUSE, PAUL M.: Biochemistry of Plants		1880-1960. Wellington Brink	51-52
and Animals. With M. Frank Mallette and		displays garden produce. Cover picture	[50]
Carl O. Claggett. Review	192	keeping our land productive. Quotation	[74]
ALVERSON, KENT: Saga of the Sand Dunes	12-14	memorialized in soils professorship	251
ANDERSON, CLINTON P.: Grass can make		productive land is our base. Quotation	[50]
beautiful. Quotation	[218]	SCS technicians are land doctors. Quotation	148
ANDERSON, H. OBERT: The Big 40. With R.		What Others Say About	53
K. Lawson	231-232	BENNETT, WILLIAM A.: Dragline Irrigation for	
ANDERSON, ROBERT S.: Multiple Benefits on		Apple Orchards	84-85
the Shakopee	206-207		

	Page
Benson, Ezra Taft, quotation on Hugh Bennett.....	53
Bermuda Pays Big. Bernice DeShong.....	236-237
Beuschlein, Muriel—	
receives Conservation Education award.....	251
Things To Do in Science and Conservation.	
With Byron L. Ashbaugh. Review.....	192
Big 40. H. Obert Anderson and R. K. Lawson.....	231-232
Biochemistry of Plants and Animals. Review	
by B. D. Blakely.....	192
Birdsfoot Trefoil Pastures in Iowa. John K. Maddy.....	222-223
BJERRUM, L.: From Theory to Practice in Soil Mechanics. With A. Casagrande, R. B. Peck, and A. W. Skempton. Review.....	143
BLAISDELL, FRED W.—	
designs portable hydraulic channel.....	80-81
St. Anthony Falls Hydraulic Laboratory... ..	280-882
BLAKELY, B. D.: review of Biochemistry of Plants and Animals.....	192
BODDY, HERB—	
19 Years of Conservation Pays.....	15-17
Alternate-Row Seeding of Grasses and Legumes.....	89-91
BOEKER, HAROLD M.: A Conservation Plan for 1,500 Cattle and 100,000 Deer. With Ellis F. Sedgley.....	177-178
Book Designer Turns Conservationist. Lester Fox.....	22-23
Book Reviews. See Reviews.	
BOONE, DAN: Pine Trees for Cotton. With Claude K. Compton.....	252-254
Boy Scouts of America—	
carry out conservation plan (Tex.).....	65-66
conservation activities, present and future..	63-65
BRADFORD, HAROLD W.: Dam Overhauled By "Arctic" Engineering. With Truman G. Spannagel.....	270-272
BRADY, NYLE C.: The Nature and Properties of Soils. With Harry O. Buckman. Review..	47
BREDEMEIER, LORENZ F.: Sandhills Ranchers Go for Trees. With Walt Ekdahl and Donell D. Sylvester.....	250-251
Briggs, Ezra, comments on district program....	17
BROOKS, DAVID C.: Hunting Preserve in Ohio.....	256-257
Browntopmillet for Wildlife. Morris Byrd and W. C. Young.....	34-35
Brush control—	
Land Improvement Through. Harry M. Elwell.....	56-59
root-plowing and reseeding (Tex.).....	188-189
seeding trees by helicopter (Wash.).....	91-92
Bryant, John M., of California, District Profile. Alex Gay.....	44-45
BUCKMAN, HARRY O.: The Nature and Properties of Soils. With Nyle C. Brady. Review..	47
BUE, EUGENE C.: Watershed Structures Call for Major Engineering Planning. With Carroll A. Reese.....	276-278
Bulbs Can't Stand Wet Feet. Andrew Linn.....	286-287
BULLOCK, ARNOLD E.: Taming the Pit River.....	210-211

	Page
BYRD, MORRIS: Browntopmillet for Wildlife. With W. C. Young.....	34-35
CALEF, WESLEY: Private Grazing and Public Lands. Review.....	239-240
California—	
John M. Bryant, District Profile.....	44-45
farm zoning districts.....	76-78
geologic studies help solve sediment problem..	273
Mendocino County, erosion control on woodlands.....	262-263
Modoc County, meadow renovation program.....	127-128
Pit River, channel improvement.....	210-211
Sonoma County, benefits of conservation work.....	15-17
Canadian land not farmed to best advantage....	262
Careers in Conservation. Soil Conservation Society of America. Review.....	263
CASAGRANDE, A.: From Theory to Practice in Soil Mechanics. With L. Bjerrum, R. B. Peck, and A. W. Skempton. Review.....	143
Cattle—	
in Florida.....	130
more profitable than wheat (S. Dak.).....	42-43
numbers in U.S.....	30, 144
on irrigated farmlands.....	211
operation on the Ralph Barby Ranch (Okla.)..	86-88
<i>Charlotte Observer</i> , quotation on Hugh Bennett...	53
CHENEY, HOWARD V.: Pheasants—By the Hundreds.....	187-188
CHURCH, RONALD: A Faithful Soil Steward. District Profile.....	259-260
CLAGETT, CARL O.: Biochemistry of Plants and Animals. With M. Frank Mallette and Paul M. Althouse. Review.....	192
CLARK, IRA: Good Grassland Management—A Family Tradition.....	220-222
CLAWSON, MARION: Land for the Future. With R. Burnell Held and Charles H. Stoddard. Review.....	143
CLEMENTS, EDITH S.: Adventures in Ecology. Review.....	96
CLEPPER, HENRY: American Forestry—Six Decades of Growth. With Arthur B. Meyer. Review.....	263
Colorado—	
Colorado Springs, Boy Scout Jamboree.....	[60]-63
irrigation system modernized.....	270-272
Kiowa watershed serves as pilot.....	196-198
mountain meadow improvement studies....	135-136
Rio Grande National Forest, sheep grazing. Cover picture.....	[122]
White River Plateau, range improvement..	177-178
Community Push Gets Trees Planted. Eudis Singleton.....	260-262
COMPTON, CLAUDE K.: Pine Trees for Cotton—Sound Land Use, Profit. With Dan Boone.....	252-254
Connecticut—	
Bethel, book designer turns conservationist..	22-23
Fairfield County, better Christmas trees....	258-259
Conservation—	
activities of the Boy Scouts of America.....	63-65

	Page		Page
Conservation—Continued		DARK, CLEO: District Profile, Carl E. Hicks of Texas.....	166-167
Bivouac—The Fifth Boy Scout Jamboree.		DAVIS, DAVID O.—	224-226
Donald A. Williams.....	[60]-63	Land Judging Contests.....	224-226
education. <i>See</i> Education, conservation.		Union County Swings from Livestock to Dust to Livestock. With Paul N. Miller.....	9-11
Help for Builders, Developers, and Contractors. Virginia SCD Association. Review.	288	DAVIS, T. J.: Healing a Gully. Picture story.....	79
interdependency of all programs. Quotation..	[242]	DAVISON, DONALD N.: Saving and Using the	
of Natural Resources. Review by Phoebe		Runoff. With Verl G. King.....	214-215
Harrison.....	46-47	DECKER, REY S.: Soil Mechanics in Soil and	
on Farm Woodlands. Donald A. Williams..	243	Water Conservation.....	284-285
practices applied in 1960.....	163	DESHONG, BERNICE—	
Programs, Watersheds Natural Units for.		Little's Bermuda Pays Big.....	236-237
Donald A. Williams.....	195	New Wealth and Old—On Oklahoma's Table-	
Needs Inventory—		lands.....	86-88
completed.....	48	DIERKS, ERNEST: Strip Mine Becomes Wild-	
progress in 1960.....	164	life Haven.....	175-176
tree-planting needs.....	243	District(s)—	
Reserve—		agricultural zoning, three types.....	77-78
acreage, 1961.....	240	Profile. <i>See</i> Profile, District.	
participants, SCS assistance to in 1960...	164	Soil Conservation. <i>See</i> Soil Conservation	
Contour farming—		Districts.	
a beautiful sight. Quotation.....	[266]	DOUTHIT, JOE: Land, Water & People. With	
stores more moisture.....	200	Otis Tossett. Review.....	288
Contractor Plays "Boy At the Dike".....	67	Drainage—	
Cooper, Cal, likes dragline irrigation (Wash.)...	84-85	ditches for woodlands (Tex.).....	44
Cooperators—		improvements in Louisiana.....	278-279
5,629. John C. Beard.....	65-66	practices, progress in 1960.....	161-162
with SCD's, 1960.....	162	tile, improvements on bulb land (Wash.)...	286-287
Corn—		work improves mail service (S.C.).....	71-72
close-drilled, for silage.....	71	Ducks. <i>See</i> Wildlife.	
Continuous, Needs Proper Management.....	95	DUNN, LYNDE: Ranch for cattle and deer.	
hybrid, acres planted in 1960.....	144	Artwork.....	177
more on fewer acres.....	72		
stalks shred to cut erosion losses (Ind.).....	232	EARLE, J. B.: Reclaiming Gravel Mines.....	142
Cottontails and Bobwhites—On a Cattle Farm.		Ecology, Adventures in. Review by B. W.	
Dalton Rushing and R. D. Fisher.....	190-191	Allred.....	96
COUGHRAN, JOE: More Quail and Deer on a		Education, conservation—	
Texas Ranch.....	188-189	at Boy Scout Jamboree.....	[60]-63
Cover crops reduce soil and water losses.....	33	award of Wildlife Society, presentation.....	251
COYLE, JAMES J.: A New Look For Terraced		demonstrations and tours in woodland man-	
Fields.....	268-270	agement (Ind.).....	167
CRABTREE, ROE D.: Building Soil With		land judging contests (Okla.).....	224-226
Grass.....	111-112	need to inform nonfarm people.....	158-159
Cranberry Production in the Pacific Northwest.		Our Conservation Song.....	275
Earl R. Baker.....	54-56	program of the Boy Scouts of America.....	63-65
Cropping, continuous, nitrogen key to success..	11	suggestions for improvement.....	93-94
CROWLEY, CLAUDE D.: They Farm the		useful books.....	191-192
Bottomlands Again on Johnson Creek		woodland clinics for FFA-4-H boys (Tex.)...	254-255
Watershed.....	140-141	EIKLEBERRY, R. W.: They Learn About Their	
		Soil Maps By Reservation Only.....	109-111
Daily Plainsman, quotation on Hugh Bennett..	53	EKDAHL, WALT: Sandhills Ranchers Go for	
DALE, TOM—		Trees. With Lorenz F. Bredemeier and	
A New Editor.....	240	Donell D. Sylvester.....	250-251
review of Power To Produce: The Yearbook		Ellison, Carroll, gets better yields from alternate-	
of Agriculture, 1960.....	119	row seedings.....	90-91
Dam(s)—		ELWELL, HARRY M.: Land Improvement	
fertilizing by airplane (La.).....	213	Through Brush Control.....	56-59
Mulching Flood Prevention Structures.....	38-39	Engineering—	
on Johnson Creek watershed (Tenn.).....	140-141	"Artic," Dam Overhauled By. Harold W.	
on Kiowa Creek (Colo.).....	197	Bradford and Truman G. Spannagel... 270-272	
Overhauled By "Arctic" Engineering. Harold		hydrologists keep track of the water.....	285-286
W. Bradford and Truman G. Spannagel..	270-272		
Danyow, Orville, develops marsh for wildlife..	174-175		

Engineering—Continued	Page	Farmers—Continued	Page
International Congress of Agricultural Machinery.....	168	Go to Grass. Leon J. Sisk.....	19-22
Measures in Farm and Watershed Conservation. Donald A. Williams.....	267	learn to use zoning to advantage.....	76-78
planning in watershed projects (Ga.).....	276-278	like sericea lespedeza (Ark.).....	233-234
progress report.....	161-162	meet to learn about their soil maps.....	109-111
soil mechanics in conservation planning.....	284-285	produce more corn on fewer acres.....	72
Engineers find soil surveys useful.....	103-104	share of consumer dollar drops.....	14
Erosion—		skill and personal preferences important in farm planning.....	153
control—		Farmers Home Administration—	
by shredding cornstalks (Ind.).....	232	requires conservation plans on borrowers' farms.....	5, 8
In Woodland Harvest. Robert A. Dellberg.....	262-263	Water Facilities Program aids water development (N. Mex.).....	10
practices, progress report.....	161	Farming—	
through stripcropping (Mo.).....	68-69	conservation, benefits wildlife.....	171
through tree planting (S.C.).....	3-5	Stubble Mulch. Walter E. Selby.....	176
effect on land. Quotation.....	[26]	Tree, Conservation, Is a Way of Life With the Wilsons. Herbert F. Gaines.....	244-246
on Piedmont Soils. A. P. Barnett and B. H. Hendrickson.....	31-34	FEIST, IRVING J.: A Look At the Future for Conservation Activities.....	63-65
Exploring the River. Review by D. Harper Simms.....	191	FERGUSON, WILSON W.: Arkansas Farmers Like Sericea Lespedeza.....	233-234
Extension Service personnel help train boys at Youth Range Camp (Tex.).....	132	FERSCH, GEORGE L.: Natural Resource Use In Our Economy. With William H. Stead. Review.....	191
Fallout Shelters for Farm Animals.....	272	Fertilizer(s)—	
FAO sponsors conference on fish.....	207	effect on vegetative composition (chart).....	135
Farm(s)—		method of placement with seed affects yields.....	228-230
and Ranch Planning—		more nutrients per ton today.....	72
Base for Full Conservation. Donald A. Williams.....	147	nitrogen—	
progress report.....	162-163	heavier use making soils more acid.....	5
appraisal with soil surveys.....	107	What Happens to.....	120
capital investment per worker, 1959.....	48	recommendations improved by map.....	120
Certified Tree, acreage in 1959.....	88	tests on application rates.....	240
Donated to SCD. Mitchell G. Hassler.....	167-168	types used on browntop millet.....	35
fire losses, 1960.....	270	Fertilizing Flood Prevention Structures. James Guillory.....	213
horizontally and deeply ploughed. Quotation.....	[266]	Fescue, Tall—A Winter Grass for Florida. H. E. Van Arsdall and LeeRoy Wiggins... ..	235-236
Machinery Congress, International.....	168	Financing a watershed project.....	203-204
need for a written plan.....	151	Fish—	
number having basic conservation plan.....	162	Are Soil Survey "Customers." Bernhard A. Roth.....	180-181
output—		Catfish Farming. Brice M. Latham.....	189-190
in U.S., rise in 1950's.....	216	farm pond built for trout.....	179-180
World, Sets Record.....	216	For Food—international conference.....	207
plans. See Plan(s), conservation.		Fish and Wildlife Service—	
Planning. W. O. Lambeth. Picture story. [156-157]		acquires wetlands with bird hunting stamp funds.....	173
producing over \$5,000 gross sales, 1950-60..	273	Better Hunting and Fishing on Small Watershed Projects. Review.....	288
products, U.S., importers of.....	150	stocks pond on conservation hunting preserve (Ohio).....	256-257
Safety Week, 1961.....	287	FISHER, LEO L.: Woodland Clinics for FFA-4-H Boys.....	254-255
size increase.....	176	FISHER, R. D.: Cottontails and Bobwhites—On a Cattle Farm. With Dalton Rushing. ..	190-191
U.S., use of electricity.....	143	Flood—	
workers—		prevention—	
in U.S., most are family workers.....	92	benefits wildlife (Minn.).....	206-207
productivity rises faster than in industry..	168	channel improvement (Calif.).....	210-211
Farmers—			
and Ranchers—What They Say About Conservation Plans. Cal L. Roark.....	148-150		
conservation—			
get more lasting benefits from ACP cost sharing.....	148		
Halt Missouri's Little Dust Bowl. Gaylord H. Wisner.....	68-69		

Flood—Continued	Page	GAY, ALEX: District Profile, John M. Bryant	Page
prevention—continued		of California.....	44-45
in Colorado.....	196-198	GEIGER, A. F.: Geologic Studies Pay Off in	
on Elk Creek watershed (Ind.).....	199-200	Conservation.....	272-273
progress in 1960.....	163	Geologic—	
project on Johnson Creek watershed		data, progress report.....	162
(Tenn.).....	140-141	Studies Pay Off in Conservation. A. F.	
structures, mulching of.....	38-39	Geiger.....	272-273
Problems on Florida Flatlands. Sellers		Georgia—	
Archer.....	201-203	Bulloch County, mulch planting of soybeans.	
Florida—		Picture story.....	36-37
flood problems studied.....	201-203	Madison County, engineering planning in wa-	
Perdido River SCD, tall fescue fills the		tershed project.....	276-278
gap.....	235-236	parallel terracing.....	268-269
Range Management in. L. L. Yarlett.....	130-132	Watkinsville, research on soil and water losses.	32-34
Fonnesbeck, Myron and Norman, operate farm		Glaus, Warren, finds beef cattle more profitable	
according to plan.....	154-155	than small grains.....	42-43
FORD, A. L.: Taking Guesswork Out of Nursery		Gold Ridge Farmers Say: 19 Years of Conser-	
Stock Needs.....	246-247	vation Pays. Herb Boddy.....	15-17
Foreign Agricultural Service—		GOWDER, LUTHER E.: Beaver Pond Grows Duck	
forecasts record world farm output.....	216	Food.....	182-183
training programs, assistance by SCS in 1960..	192	GRAHAM, EDWARD H.: Wildlife and land use.	
Forests cover one-third of land surface.....	251	Quotation.....	[170]
Forest Service—		Grain Sorghum, Irrigating For Efficient Water	
cooperates in—		Use. Jack T. Musick.....	117-119
promoting range conservation stamp.....	124	Grass(es)—	
river-basin surveys.....	164	And Politics. Review by F. G. Renner.....	239
woodland soil-site correlation studies.....	248	becomes a crop (Tenn.).....	19-22
sheep grazing in Rio Grande National Forest.		bermudagrass—	
Cover picture.....	[122]	comparison of species.....	240
trees planted by private landowners, 1960....	254	pays big (Okla.).....	236-237
Forestry, American—Six Decades of Growth.		planted on mined land (S.C.).....	142
Review by Paul Lemmon.....	263	used to heal gully (Okla.).....	79
FOSS, PHILLIP P.: Politics and Grass. Re-		Better Than Wheat on a Northern Plains Farm.	
view.....	239	Walter N. Parmeter.....	42-43
FOSTER, A. B.: Knox County Revives Through		Building Soil With. Roe D. Crabtree.....	111-112
Good Leadership of District Supervisors.....	6-8	can make beautiful.....	[218]
FOX, ADRIAN C.: review of—		Crops in the Soil and Water Conservation Pro-	
Manual for Outdoor Laboratories.....	47	gram. Donald A. Williams.....	219
Natural Resource Use in Our Economy.....	191	developed in 1960.....	161
Fox, Kel, finds wheatgrass the answer.....	237-239	establishment through brush elimination and	
FOX, LESTER—		deferred grazing.....	57-59
Book Designer Turns Conservationist.....	22-23	growth habits under grazing.....	125-127
District Profile, Hans L. van Leer of Massa-		improved, increase hay yields (Nev.).....	27
chusetts.....	215-216	Latar orchardgrass, development.....	138-139
Trees Won't Grow Just Anywhere.....	258-259	orchardgrass and Ladino clover pasture (Pa.).	
FREEMAN, ORVILLE L.—		Cover picture.....	[26]
signs memorandum of understanding with		Planting With Fewer Failures and Lower Costs.	
Gerlach (Nev.) SCD. Photograph.....	264	C. W. Gantt, Jr., and W. C. Hulburt.....	228-230
We must look at conservation. Quotation....	[242]	seeding program efficient (Okla.).....	17-19
Fujita, Mr. & Mrs. Seiichi, receive Outstanding		species used—	
Conservation Farmer award. Photograph....	24	as hay for mulching flood prevention struc-	
GAINES, HERBERT F.: Conservation Tree Farm-		tures.....	38-39
ing Is a Way of Life With the Wilsons.....	244-24	in reseeding pastures (Idaho).....	220-221
GANTT, C. W., JR.: Wanted—Grass Planting		in tame grass mixture.....	42-43
With Fewer Failures and Lower Costs. With		in tame pasture in Florida.....	131
W. C. Hulburt.....	228-230	with legumes in alternate rows.....	89-91
Garrett, Glen E., manages ranch for beef and		tall fescue provides winter grazing (Fla.)..	235-236
wildlife.....	184-185	tests on fertilizer application rates.....	240
Gaskill, Frank, plugs hole in dike with automobile..	67	wheatgrass—	
GASTON, T. L.: review of Land, Water & People..	288	crested, planted on public range (Utah)..	144
		improves range and controls erosion	
		(Ariz.).....	237-239

	Page		Page
Grasses—Continued		Hay—	
yields under irrigation.....	240	Four Times the, With Half the Water.	
Grassed Waterways Boon to Kansas Farm.		Lenard Smith.....	226-227
George R. Smith and Grant Woodward....	274-275	Production Increased 7-fold, Cattle 10-fold.	
Grassland(s)—		Tom Turner.....	27-29
agriculture, need for. Quotation.....	[122]	HAYES, WILLIAM: Path Valley's Green Acres.	
farming—		With Henry Warner.....	230-231
brings new life to Path Valley (Pa.)....	230-231	HEDRICK, CLARENCE: Snow Survey Forecasts	
on Illinois farm.....	231-232	Make the Difference.....	115-116
Management, Good, a Family Tradition.		HELD, R. BURNELL: Land for the Future.	
Ira Clark.....	220-222	With Marion Clawson and Charles H. Stod-	
National, designated.....	30	dard. Review.....	143
Grazing—		Help Keep Our Land Beautiful. Soil Conser-	
close, effects of.....	125-127	vation Society of America. Review.....	263
improved by pasture reseeding (Idaho)....	220-222	HENDRICKSON, B. H.: Erosion on Piedmont	
improvements for cattle and deer (Colo.)..	177-178	Soils. With A. P. Barnett.....	31-34
management on southern woodlands.....	144, 161	Hicks, Carl E. of Texas, District Profile. Cleo	
on farm woodlands.....	253	Dark.....	166-167
Taylor Grazing Act, reviews.....	239	HILL, MARK E.: More Stock Watering Places..	29-30
Great Plains—		HILLIARD, T. H.: Mulch Planting of Soybeans.	
Conservation Program—		Picture story.....	36-37
answers problems (S. Dak.).....	184-185	HOCKENSMITH, ROY D.: Soil Surveys Furnish	
boosts district program (N. Mex.).....	11	Basic Data For All Land Uses.....	100-105
in Beaver County, Okla.....	87-88	Hubbard brothers practice good grassland man-	
plan, value.....	149	agement (Idaho).....	220-222
progress in 1960.....	164	Huff, Sam B., comments on farmers who plow up	
requires all range cooperators to schedule		and down hill.....	45
“proper use”.....	127	HULBURT, W. C.: Wanted—Grass Planting	
wildlife improvements (Kans.).....	187-188	With Fewer Failures and Lower Costs. With	
improved windbreak design.....	160	C. W. Gantt, Jr.....	228-230
irrigating grain sorghum.....	117-119	Hunting—	
Southern, ground-water supplies decrease....	211	On the Contour. John Nehoda.....	183-184
Group action gets trees planted (Ky.).....	260-262	Preserve in Ohio. David C. Brooks.....	256-257
GUILLORY, JAMES: Fertilizing Flood Preven-		Hurd, F. S., of Oklahoma, District Profile.	
tion Structures.....	213	Wilber E. Parrish.....	70-71
Gully—		Hussa, W. O., renovates mountain meadow..	127-128
control with grassed waterways (Kans.)....	274-275	HUTTON, PAUL: Soil Stewardship Week—A	
Healing a. T. J. Davis. Picture story.....	79	Community Undertaking.....	234-235
Hamer, W. S., plants living fences for wildlife..	190-191	Hydraulic—	
Hamilton, Grayfield, makes profitable duck pond		channel, portable, for demonstration and	
from beaver pond.....	182-183	training.....	80-81
Hancock, Harley L., donates farm to SCD....	167-168	Laboratory, St. Anthony Falls. Fred W.	
HARDIN, ROBERT A.: From Cash Crops to Live-		Blaisdell.....	280-282
stock.....	165-166	Hydrologic Relationships on Watersheds in Ohio.	
Harper, Frank B., new editor of Soil Conserva-		Lloyd L. Harrold.....	208-210
tion Magazine.....	240	Hydrologists Keep Track of the Water. R. G.	
Harrell, Woodrow, originates woodland clinics		Andrews.....	285-286
(Tex.).....	254-255	HYPES, WAYNE M.: Trout Pond in Virginia..	179-180
HARRISON, PHOEBE: review of The Conserva-		Idaho—	
tion of Natural Resources.....	46-47	Ada County, group irrigation project.....	129
HARROLD, LLOYD L.: Hydrologic Relationships		Bear Lake, saving and using runoff.....	214-215
on Watersheds in Ohio.....	208-210	Bingham County, more stock watering places..	29-30
Hartin, Mrs. Theo P., writes conservation song		Caribou County, good grassland manage-	
for schoolchildren.....	275	ment.....	220-222
HASSLER, MITCHELL G.: Farm Donated to		Thorn Creek, range improvement project..	136-138
SCD.....	167-168	Twin Falls, farm planning with snow-survey	
HAW, RICHARD C.: The Conservation of Natu-		forecasts.....	115-116
ral Resources. Review.....	46-47	Weston, brothers operate farm according to	
Hawaii, Outstanding Farmer of the Year award		plan.....	154-155
presentation. Photograph.....	24	Illinois—	
HAWK, MARTIN MAX: Terrace Club Gets Re-		Omaha, farmer switches from grain to live-	
sults.....	283	stock.....	231-232

Illinois—Continued	Page	Josephy, Robert, turns from book designing to conservation farming.....	Page
research on nitrogen fertilizer.....	120	Just, Julius A., wildlife likes his windbreaks....	22-23
Urbana, experiments in continuous corn.....	95		247
Income—		Kansas—	
increase through—		Geary County, farmers learn about their soil maps.....	109-111
conservation farming.....	4, 8, 14, 20-22	Grinnell, wildlife improvements.....	187-188
pasture improvement.....	222-223	Jefferson County, grassed waterways pay..	274-275
nonfarm, of rural families in Tennessee.....	92	research on water management.....	117-119
Indian Affairs, Bureau of, helps promote range conservation stamp.....	124	Karmex controls weeds in windbreaks.....	69
Indiana—		Kayler, Roy, switches from cash crops to live-stock.....	165-166
Crawford County, improved pasture. Cover picture.....	[218]	KELLOGG, CHARLES E.—	
farm donated to SCD.....	167-168	Basic Theory of Soil Conservation Plans....	151-153
Knox County revives through leadership of SCD supervisors.....	6-8	review of—	
Lafayette, shredding cornstalks to cut erosion losses.....	232	From Theory to Practice in Soil Mechanics..	143
Washington County, flood prevention on Elk Creek.....	199-200	Nature and Properties of Soils.....	47
Iowa—		Soil and Its Fertility.....	95-96
birdsfoot trefoil pastures pay dividends....	222-223	soil science. Quotation.....	[98]
Grundy County, terrace club gets results....	283	KENNARD, J. G.: According to Plan.....	154-155
parallel terracing.....	269	Kentucky, Perry County, tree-planting cham-pions.....	260-262
Polk County, soil survey used for tax assess-ment.....	102-103	KINCAID, JOHN I.: Local Financing of Water-shed Projects.....	203-204
Irrigating Grain Sorghum For Efficient Water Use. Jack T. Musick.....	117-119	KING, BARRINGTON: Pastures, Pines, and Ponds Heal Erosion Scars of Fairfield County..	3-5
Irrigation—		KING, VERL G.: Saving and Using the Runoff. With Donald N. Davison.....	214-215
better water supply through dam overhaul..	270-272	Kiowa Serves As Pilot for Watersheds in Colo-rado. Herbert I. Jones.....	196-198
Dragline, For Apple Orchards. William A. Bennett.....	84-85	Knox County Revives Through Good Leader-ship of District Supervisors. A. B. Foster....	6-8
effect on vegetative composition (chart)....	135	Knutson, Harold, grows more bulbs through drainage improvements.....	286-287
farming aided by snow-survey forecasts (Idaho).....	115-116	KOERNER, ROBERT O.: Pange and Wildlife Management on a South Dakota Ranch...	184-185
improvements bring more hay and cattle (Nev.).....	27-29		
increases forage yields.....	240	Ladies Help Steer. Herbert I. Jones.....	212-213
on mountain meadows, research.....	135-136	LAMBETH, W. O.: Farm Planning. Picture story.....	[156-157]
pipe replaces ditches, brings more water....	129	Land—	
progress report.....	162	capability—	
saving the runoff (Idaho).....	214-215	groupings.....	101
sprinkler—		system benefits wildlife.....	171
for cranberry bogs.....	54-56	For the Future. Review by John W. Bar-nard.....	143
with draglines (Wash.).....	84-85	Improvement Through Brush Control. Harry M. Elwell.....	56-59
Izvestiya, description of duststorm in U.S.S.R....	69	Judging Contests. David O. Davis.....	224-226
JEFFERSON, THOMAS: In a farm horizontally and deeply ploughed. Quotation.....	[266]	keeping it productive. Quotation.....	[74]
JENKINS, TARLETON A.—		leveling for better irrigation.....	28-29, 226-227
A Lot About Snow.....	113-114	Not Farmed to Best Advantage.....	262
A New Hustle.....	81-83	productive, is our base. Quotation.....	[50]
Johnson Creek Watershed, They Farm the Bot-tomlands Again. Claude D. Crowley.....	140-141	treatment progress in 1960.....	163
Jones, Herbert I.—		Utilization Program—	
Kiowa Serves As Pilot for Watersheds in Colorado.....	196-198	lands designated National Grasslands....	30
Ladies Help Steer.....	212-213	revegetating bare lands.....	10
Two-Way Radio Speeds Conservation Work..	17-19	values increased through conservation prac-tices.....	7-8, 14
Jones, Joe E., plants close-drilled corn for silage..	71	Water & People—A History of the National Association of Soil Conservation Districts. Review by T. L. Gaston.....	288
Jones, Philip, finds out trees won't grow just anywhere.....	258-259		

Land Management, Bureau of—	Page	Maps To Show Subsoil Phosphorus and Potas-	Page
helps promote range conservation stamp.....	124	sium.....	120
range improvements.....	136-138, 177-178	Martin, Santford, quotation on Hugh Bennett..	53
seeds publicly owned rangeland (Utah).....	144	Maryland, Montgomery County, soil surveyor at	
Land Use—		work. Cover picture.....	[98]
improvement through cost accounting.....	165-166	Massachusetts, Hans L. van Leer of. District	
modern, in U.S. Cover picture.....	[74]	Profile.....	215-216
planning needed right now.....	158-159	MAYVILLE, ALLEN G.: Not Worth the Taxes..	174-175
Proper, Soils the Key to. Donald A. Williams..	99	MEYER, ARTHUR B.: American Forestry—Six	
Soil Surveys Furnish Basic Data for. Roy		Decades of Growth. With Henry Clepper.	
D. Hockensmith.....	100-105	Review.....	263
unwise, and rurban sprawl cause conflicts.....	76-77	Michigan—	
Latar Orchardgrass. Edwin O. Nurmi.....	138-139	Clarence Reenders, District Profile.....	259-260
LATHAM, BRICE M.: Catfish Farming.....	189-190	Ottawa County stabilized through conserva-	
LAWSON, R. K.: The Big 40. With H. Obert		tion practices.....	12-14
Anderson.....	231-232	MILLER, PAUL N.: Union County Swings From	
LEITHEAD, HORACE L.: Take Half and Leave		Livestock to Dust to Livestock. With David	
Half.....	125-127	O. Davis.....	9-11
LEMMON, PAUL: review of American Forestry—		<i>Milwaukee Journal</i> , quotation on Hugh Bennett..	53
Six Decades of Growth.....	263	Mines, Gravel, Reclaiming. J. B. Earle.....	142
Lime—		Minnesota—	
needs different on different soils.....	215	Becker County, sportsmen develop wetland	
reduced use making soils more acid.....	5	area for wildlife.....	186-187
soil test for, improvement.....	119-120	Carver County, trees fit into conservation pat-	
LINN, ANDREW: Bulbs Can't Stand Wet		tern. Cover picture.....	[242]
Feet.....	286-287	geologic investigations save money.....	272
Little, Jim, likes bermudagrass.....	236-237	portable hydraulic channel.....	80-81
Livestock—		St. Anthony Falls Hydraulic Laboratory... ..	280-282
From Cash Crops to. Robert A. Hardin..	165-166	Shakopee watershed, multiple benefits.....	206-207
Production on Southern Woodlands. Robert		Missouri, Dunklin County, wind erosion con-	
E. Williams.....	144	trolled by stripcropping.....	68-69
to Dust to Livestock. David O. Davis and		<i>Mobile Press-Register</i> , quotation on Hugh Ben-	
Paul N. Miller.....	9-11	nett.....	53
LIVINGSTON, J. S.: The Mail Goes Through—		Mountain meadow(s)—	
Rain or Shine. With J. F. Murphree.....	71-72	Improvement. Forrest M. Willhite and Hay-	
Local Financing of Watershed Projects. John		den K. Rouse.....	134-136
I. Kincaid.....	203-204	Sod Busting on. Charles N. Saulisberry... ..	127-128
Louisiana—		Mulch(es)—	
fertilizing structures by airplane.....	213	in orchard (Conn.).....	23
new water management system.....	278-279	new, in 1960.....	161
pipe overfall installation. Picture story.....	40-41	Planting of Soybeans. T. H. Hilliard. Pic-	
Lothspeich, Larry, reconditions land with alfalfa		ture story.....	36-37
and grass.....	111-112	Mulching Flood Prevention Structures. Wil-	
Lucas, Phillip, grows better timber through		liam L. Smith.....	38-39
water control.....	43-44	Multiple Benefits on the Shakopee. Robert S.	
McIlwain, C. W., harvests catfish from stock-		Anderson.....	206-207
water pond.....	189-190	MURPHREE, J. F.: The Mail Goes Through—	
McKinley, H. L., improves hunting preserve		Rain or Shine. With J. S. Livingston.....	71-72
with conservation plan.....	256-257	Murray, James E., quotation on soil conservation	
Mack, E. B., plants close-drilled corn for silage..	71	districts.....	[2]
Madden, Blaine, uses dragline irrigation.....	84-85	MUSICK, JACK T.: Irrigating Grain Sorghum	
MADDY, JOHN K.: Birdsfoot Trefoil Pastures		for Efficient Water Use.....	117-119
in Iowa.....	222-223	National Watershed Congress, 8th annual.....	216
Mail Goes Through—Rain or Shine. J. S.		Natural Resource Use in Our Economy. Re-	
Livingston and J. F. Murphree.....	71-72	view by Adrian C. Fox.....	191
Maine, soil mapping for salmon and clams... ..	180-181	Nebraska—	
MALLETTE, M. FRANK: Biochemistry of Plants		Gering Valley, women spark watershed pro-	
and Animals. With Paul M. Althouse and		ject.....	212-213
Carl O. Claggett. Review.....	192	Otoe County, structures and land treatment	
Manual for Outdoor Laboratories. Review by		measures. Cover picture.....	[194]
Adrian C. Fox.....	47	sandhills ranchers get results from tree plant-	
		ing.....	250-251

	Page
NEHODA, JOHN: Hunting on the Contour.....	183-184
Nesson, James E., of Utah, District Profile. Evan C. Thompson.....	94-95
Nevada—	
Baker Creek, snow-survey shelter. Cover picture.....	[146]
Carlin, geologic investigations assure good irrigation well.....	272-273
Elko County, more cattle and hay with less water.....	27-29, 226-227
New Editor. Tom Dale.....	240
New Hustle—SCS Supervisors in Texas Profit from Management Training. Tarleton Jenkins.....	81-83
New Jersey, contractor plugs hole in embankment with his automobile.....	67
New Methods for New Problems. Donald A. Williams.....	75
New Mexico—	
Santa Fe, western snow conference.....	113-114
Union County, revegetation program.....	9-11
New Wealth and Old—On Oklahoma's Tablelands. Bernice DeShong.....	86-88
New York Times, quotation on Hugh Bennett	53
Nitrogen—	
Fertilizer, What Happens to.....	120
key to continuous cropping.....	11
Tests, Better, for Wisconsin Soils.....	114
North Carolina—	
farm planning. Picture story.....	[156-157]
Hugh Bennett professorship.....	251
North Dakota—	
Berlin, windbreaks provide wildlife habitat...	247
Garrison, strip mine becomes wildlife haven...	175-176
over-the-row cultivation speeds tree care...	255-256
Not Worth the Taxes. Allen G. Mayville...	174-175
NURMI, EDWIN O.: Latar Orchardgrass.....	138-139
Nursery Stock Needs, Taking Guesswork Out of. A. L. Ford.....	246-247
Ohio—	
Columbus, conservation shooting preserve...	256-257
Coshocton, hydrologic studies on watersheds.....	208-210
Develops Better Soil Test.....	119-120
O'KEEFE, M. P.: Tree Seeding By Helicopter...	91-92
Oklahoma—	
Beaver County, new wealth and old.....	86-88
District Sponsors Water Safety. Ray Walker.....	205-206
Garvin County, bermudagrass pays big....	236-237
Holdenville, healing a gully. Picture story...	79
F. S. Hurd, District Profile.....	70-71
Oklahoma City, land judging contests.....	224-226
research on brush control.....	57-59
Orchard(s)—	
apple, irrigating with draglines (Wash.).....	84-85
made profitable by conservation practices (Conn.).....	22-23
Orchardgrass, Latar. Edwin O. Nurmi.....	138-139
Oregon—	
Marion County, alternate-row seeding.....	89-91

	Page
Oregon—Continued	
western, wildlife farming.....	172-173
Osborn, C. R., builds pond for trout.....	179-180
O'Trimble, Eugene, likes grassed waterways...	274-275
Over-the-Row Cultivation Speeds Tree Care	
Job. Elmer L. Worthington.....	255-256
Pacific Northwest, Cranberry Production in.	
Earl R. Baker.....	54-56
PARMETER, WALTER N.: Grass Better Than Wheat on a Northern Plains Farm.....	42-43
PARRISH, WILBER E.: District Profile, F. S. Hurd of Oklahoma.....	70-71
Pastoor, John, plans operations on basis of snow-survey forecasts.....	115-116
Pasture(s)—	
Birdsfoot Trefoil, in Iowa. John K. Maddy.....	222-223
deferment discourages overgrazing.....	127
development through brush control.....	57-59
improved grass-legume (Ind.). Cover picture.....	[218]
improvement—	
needed.....	219
quadruples hay yields (Nev.).....	226-227
with sericea lespedeza.....	233-234
Pines, and Ponds Heal Erosion Scars of Fairfield County. Barrington King.....	3-5
tame and native, combination effective in Florida.....	131
topdressing pays.....	133
Path Valley's Green Acres. William Hayes and Henry Warner.....	230-231
Patten, J. H., finds watershed program helps honey production.....	204
PAVELEK, HENRY J.: Wildlife Farming in Oregon.....	172-173
PECK, R. B.: From Theory to Practice in Soil Mechanics. With R. Bjerrum, A. Casagrande, and A. W. Skempton. Review.....	143
PEDERSON, RUDY J.: Youth Range Camp in Texas.....	132-133
Pennsylvania—	
Franklin County, grassland farming.....	230-231
Greensburg, hunting on the contour.....	183-184
Harrisburg, sediment measured.....	83
Northumberland County, orchardgrass and Ladino clover pasture. Cover picture.....	[26]
Turnpike, as it crosses Chester County. Cover picture.....	[74]
PERRY, JOHN, and JANE GREVERUS: Exploring the River. Review.....	191
Pheasants By the Hundreds. Howard V. Cheney.....	187-188
Phillips, Eddie, provides good hunting on conservation farm.....	183-184
Phosphorus Level, High, Helps Beat Drought...	144
Pipe—	
Overfall, How To Install a. Larkin B. Agnew. Picture story.....	40-41
Replaces Ditch. Robert E. Swanson.....	129
PLAIR, T. B.: Tree Crops To Fit the Land...	248-249

	Page		Page
Plan, According To. J. G. Kennard.....	154-155	Radio, Two-Way, Speeds Conservation Work.	
Plan Your Farm—Farm Your Plan. Cartoon..	149	Herbert I. Jones.....	17-19
Plans, conservation—		Radioactivity—	
Basic Theory of. Charles E. Kellogg.....	151-153	fallout shelters for farm animals.....	272
coordinated, importance of.....	147	work, SCS responsibilities in.....	159-160
developed and revised in 1960.....	162	Rainfall—	
for Boy Scout camp (Tex.).....	65-66	absorbed better by stubble-mulched soil.....	155
For 1,500 Cattle and 100,000 Deer. Ellis F.		excessive-rate, closely related to erosion rate..	32-33
Sedgley and Harold M. Boeker.....	177-178	<i>Raleigh News and Observer</i> , quotation on Hugh	
increase land values (Ind.).....	7-8	Bennett.....	53
the only safe shortcut.....	168	Ranchers—	
What Farmers and Ranchers Say About. Cal		launch meadow renovation program (Calif.)..	127-128
L. Roark.....	148-150	Sandhills, Go For Trees. Lorenz F. Brede-	
Planning—		meier, Walt Ekdahl, and Donell D. Syl-	
and financing a watershed program.....	201-204	vester.....	250-251
conservation—		“take half and leave half”.....	125-127
calls for engineering skills.....	267	Range—	
objective. Quotation.....	[146]	and Wildlife Management on a South Dakota	
engineering, in watershed projects (Ga.)...	276-278	Ranch. Robert O. Koerner.....	184-185
Farm. W. O. Lambeth. Picture story...	[156-157]	Conservation. Donald A. Williams.....	123
farm and ranch—		conservation postage stamp, release.....	124
progress report.....	162-163	Improvement. Cartoon.....	178
The Base for Full Conservation. Donald		improvement project (Idaho).....	136-138
A. Williams.....	147	Management in Florida. L. L. Yarlett....	130-132
officials find soil surveys valuable.....	103-106	Seeding: Does It Pay?.....	144
wiser, needed for use of our resources.....	75	Range Management, American Society of—	
Plant(s)—		conducts Youth Range Camp in Texas....	132-133
conservation, better techniques for establish-		helps promote range conservation stamp.....	124
ing.....	161	Realtor's Views About Soil Surveys. Verlin	
materials—		W. Smith.....	106-108
development of Latar orchardgrass.....	138-139	Red Cross helps with water-safety demonstra-	
progress in 1960.....	161	tions (Okla.).....	205-206
technology, progress report.....	160-161	Reenders, Clarence, of Michigan, District Pro-	
Plato, quotation on erosion.....	[26]	file. Ronald Church.....	259-260
Politics and Grass—The Administration of Graz-		REESE, CARROLL A.: Watershed Structures	
ing on the Public Domain. Review by F. G.		Call for Major Engineering Planning. With	
Renner.....	239	Eugene C. Buie.....	276-278
Pond(s), farm—		RENNER, F. G.—	
“catfish farming” (S.C.).....	189-190	A grassland agriculture. Quotation.....	[122]
fishing fees donated toward soils professor-		review of Politics and Grass.....	239
ship (N.C.).....	251	Report of the Administrator, Soil Conservation	
for livestock and wildlife (S. Dak.).....	184-185	Service, 1960.....	158-164
for livestock water (S.C.).....	3-5	Research—	
for trout (Va.).....	179-180	Series—	
for waterfowl (Oreg.).....	172-173	No. 57. Erosion on Piedmont Soils. A. P.	
stockwater, construction.....	29-30	Barnett and B. H. Hendrickson.....	31-34
Power to Produce: The Yearbook of Agricul-		No. 58. Land Improvement Through	
ture, 1960. Review by Tom Dale.....	119	Brush Control. Harry M. Elwell.....	56-59
PRICE, J. BOYD: Thorn Creek Cattlemen Work		No. 59. Irrigating Grain Sorghum For	
Together.....	136-138	Efficient Water Use. Jack T. Musick. 117-119	
Private Grazing and Public Lands. Review by		No. 60. Mountain Meadow Improvement.	
B. W. Allred.....	239-240	Forrest M. Willhite and Hayden K.	
Profile, district—		Rouse.....	134-136
John M. Bryant of California. Alex Gay...	44-45	No. 61. Hydrologic Relationships on	
Carl E. Hicks of Texas. Cleo Dark.....	166-167	Watersheds in Ohio. Lloyd L. Harrold. 208-210	
F. S. Hurd of Oklahoma. Wilber E. Parrish. 70-71		No. 62. Wanted: Grass Planting With	
James E. Nesson of Utah. Evan C. Thomp-		Fewer Failures and Lower Costs. C. W.	
son.....	94-95	Gantt, Jr., and W. C. Hulburt.....	228-230
Clarence Reenders of Michigan. Ronald		No. 63. St. Anthony Falls Hydraulic	
Church.....	259-260	Laboratory. Fred W. Blaisdell.....	280-282
Hans L. van Leer of Massachusetts. Lester		Reseeding brush-infested pasture (Tex.)....	188-189
Fox.....	215-216	Revegetation of sand dunes (Calif.).....	15-17

Reviews—	Page	Page
Adventures in Ecology. By Edith S. Clements.	96	RUSHING, DALTON: Cottontails and Bob-
American Forestry—Six Decades of Growth.		whites—On a Cattle Farm. With R. D.
Edited by Henry Clepper and Arthur B.		Fisher..... 190-191
Meyer.....	263	Rutman, John, gets more cattle and hay..... 27-29
Biochemistry of Plants and Animals. By		
M. Frank Mallette, Paul M. Althouse, and		Saga of the Sand Dunes. Kent Alverson..... 12-14
Carl O. Clagett.....	192	St. Anthony Falls Hydraulic Laboratory. Fred
Conservation of Natural Resources. By		W. Blaisdell..... 280-282
Richard C. Haw.....	46-47	<i>St. Louis Post-Dispatch</i> , quotation on Hugh
Exploring the River. By John and Jane		Bennett..... 53
Greverus Perry.....	191	Sandhills Ranchers Go For Trees. Lorenz F.
From Theory to Practice in Soil Mechanics.		Bredemeier, Walt Ekdahl, and Donell D. Syl-
By L. Bjerrum, A. Casagrande, R. B. Peck,		vester..... 250-251
and A. W. Skempton.....	143	SAULISBERRY, CHARLES N.: Sod Busting on
Land for the Future. By Marion Clawson,		Mountain Meadows..... 127-128
R. Burnell Held, and Charles Stoddard....	143	Schumann, George, gets more hay with less wa-
Land, Water & People. By Otis Tossett and		ter..... 226-227
Joe Douthitt.....	288	Scout—
Manual for Outdoor Laboratories. Edited by		Conservation Activities, A Look at the Future
Richard L. Weaver.....	47	For. Irving J. Feist..... 63-65
Natural Resource Use in Our Economy. By		Jamboree, 1960..... [60]-63
William H. Stead and George L. Fersch....	191	SEATON, JEROME P.: The Soil and Its Fertility.
Nature and Properties of Soils. By Harry O.		With Henry Teuscher and Rudolph Adler.
Buckman and Nyle C. Brady.....	47	Review..... 95-96
Politics and Grass. By Phillip O. Foss.....	239	SEDGLEY, ELLIS F.: A Conservation Plan For
Power To Produce: The Yearbook of Agri-		1,500 Cattle and 100,000 Deer. With Harold
culture, 1960.....	119	M. Boeker..... 177-178
Private Grazing and Public Lands. By		Seed—
Wesley Calef.....	239-240	browntopmillet, production increase..... 34-35
Soil and Its Fertility. By Henry Teuscher,		clean, aids weed control..... 204
Rudolph Adler, and Jerome P. Seaton.....	95-96	method of placement affects yields..... 228-230
Things To Do in Science and Conservation.		Seeding—
By Byron L. Ashbaugh and Muriel Beu-		alfalfa and grass for land conditioning
schlein.....	192	(Wash.)..... 111-112
Richards, William E., quotation on Hugh Ben-		Alternate-Row, of Grasses and Legumes.
nett.....	53	Herb Boddy..... 89-91
River-basin activities in 1960.....	164	beaver ponds for duck food (Ala.)..... 182-183
Rivers, great, make us forget the little rivers.		Trees By Helicopter. M. P. O'Keefe..... 91-92
Quotation.....	[194]	SELBY, WALTER E.: Stubble Mulch Farming.. 176
ROARK, CAL L.: What Farmers and Ranchers		Sheep—
Say About Conservation Plans.....	148-150	grazing on Rio Grande National Forest.
ROOSEVELT, FRANKLIN D.: We forget the little		Cover picture..... [122]
rivers. Quotation.....	[194]	Sick Watershed Gets Treatment. D. E.
Rotations—		Sloan..... 199-200
maintain organic matter and control erosion		SIMMS, D. HARPER: review of Exploring the
(Wash.).....	112	River..... 191
sod-based, cut soil losses in Piedmont.....	33-34	Singletary, R. M., delivers mail on time, thanks
ROTH, BERNHARD A.—		to conservation work..... 71-72
Fish Are Soil Survey "Customers".....	180-181	SINGLETON, EUDIS: Community Push Gets
Put the Accent on Youth.....	93-94	Trees Planted..... 260-262
ROUSE, HAYDEN K.: Mountain Meadow Im-		SISK, LEON J.: All of Smith County Prospers
provement. With Forrest M. Willhite....	134-136	When Farmers Go to Grass..... 19-22
Runoff—		SKEMPTON, A. W.: From Theory to Practice in
problems on Florida flatlands.....	201-203	Soil Mechanics. With L. Bjerrum, A. Casa-
Saving and Using. Donald N. Davison and		grande, and R. B. Peck. Review..... 143
Verl G. King.....	214-215	SLOAN, D. E.: Sick Watershed Gets Treat-
RUONA, WAYNE A.: New Home for Ducks..	186-187	ment..... 199-200
Rural zoning to protect agriculture.....	76-78	SMITH, GEORGE R.: Grassed Waterways Boon
Rurban—		to Kansas Farm. With Grant Woodward.. 274-275
progress in wildlife conservation.....	160	SMITH, LENARD: Four Times the Hay With
sprawl, causes and cures.....	76-78	Half the Water..... 226-227

SMITH, WILLIAM L.: Mulching Flood Prevention Structures.....	Page 38-39	Soil Conservation Districts—Continued	Page
SMITH, VERLIN W.: A Realtor's Views about Soil Surveys.....	106-108	Gerlach (Nev.), Secretary of Agriculture signs memorandum of understanding. Photo.	264
Snow—		Gold Ridge (Calif.) enjoys benefits of conservation work.....	15-17
A Lot About. Tarleton A. Jenkins.....	113-114	help spread land grading and smoothing.....	161
Survey(s)—		history of the NASCD, review.....	288
and water-supply forecasting, progress report..	162	impact on American agriculture. Quotation..	[2]
Forecasts Make the Difference. Clarence Hedrick.....	115-116	Jefferson County (Tenn.) sponsors Soil Stewardship Week observance.....	234-235
shelter on Baker Creek, Nev. Cover picture.....	[146]	Knox County (Ind.) owes success to outstanding supervisors.....	6-8
Soil(s)—		Lower Neches (Tex.) shows how to control excess water in woodlands.....	43-44
And Its Fertility. Review by Charles E. Kellogg.....	95-96	Marathon (Wis.), parallel terraces. Cover picture.....	[266]
Bank. See Conservation Reserve.		Northeastern (N. Mex.), revegetation program.....	9-11
becoming more acid.....	5	Owen County (Ind.) is given farm, makes it a community asset.....	167-168
Building With Grass. Roe D. Crabtree....	111-112	practices applied by cooperators, 1960.....	163
classification and correlation, progress report..	160	Stephens County (Okla.) uses two-way radio to speed operations.....	17-19
Compaction Reduces Yields.....	270	supervisors associations in Texas sponsor woodland clinics.....	254-255
fertility affects wildlife prosperity.....	66	West Ottawa (Mich.) turns sand dunes green.....	12-14
information a sound basis for range conservation.....	123	Soil Conservation Service—	
is like a bank account.....	116	and ARS Use Portable Hydraulic Channel... assistance to—	80-81
Key to Proper Land Use. Donald A. Williams.....	99	ACP participants, 1960.....	164
knowledge basic to conservation planning..	151-153	Foreign Agricultural Service, 1960.....	192
loss in the Southern Piedmont.....	31-34	employees—	
management, interactions important principle of.....	151	cash awards to, 1960.....	187
Mechanics—		in health benefits program, 1960.....	178
From Theory to Practice in. Review by Charles E. Kellogg.....	143	suggestions submitted by, 1960.....	192
In Soil and Water Conservation. Rey S. Decker.....	284-285	supervisors profit from management training.....	81-83
Nature and Properties of. Review by Charles E. Kellogg.....	47	technicians are land doctors. Quotation.....	148
productivity in land zoning.....	78	job ahead.....	75
rating for wood crops, progress report.....	160	progress report for fiscal year 1960.....	158-164
science. Quotation.....	[98]	responsibilities in radiological monitoring.....	159-160
Science, International Society of, Seventh Congress.....	23	soil samples tested, 1960.....	285
Stewardship Week—A Community Undertaking. Paul Hutton.....	234-235	wildlife policies.....	171
Temperature Tests on Cotton Planting Time.....	168	Soil Conservation Society of America—	
tests for lime and nitrogen, improvements.....	114, 119-120	annual meeting, 1961.....	287
use depends on other soils in operating unit. Chart.....	153	establishes Hugh Bennett memorial fund....	96
woodland interpretations.....	248	new educational booklets.....	263
Soil Conservation Districts—		Soil survey(s)—	
activities in 1960.....	162	A Realtor's Views About. Verlin W. Smith.....	106-108
better tree-planting programs (S. Dak.)....	246-247	acres mapped in U.S.....	159
Central Colorado (Colo.) helps prepare for Boy Scout Jamboree.....	[61]	for salmon and clams (Maine).....	180-181
Cherry County (Nebr.) develops new tree planter.....	250-251	Furnish Basic Data For All Land Uses. Roy D. Hockensmith.....	100-105
Deer Creek (Okla.) sponsors water-safety demonstrations.....	205-206	objectives.....	99
Fairfield County (S.C.) heals erosion scars...¶	3-5	operations, progress in 1960.....	159-160, 216
Fountain Valley (Colo.) helps prepare for Boy Scout Jamboree.....	[61]	reports, meetings to learn use of (Kans.)... surveyor at work. Cover picture.....	109-111 [98]
		SOLBERG, ERLING D.: Zoning To Protect Agriculture.....	76-78

South Carolina—	Page	Tennessee—Continued	Page
Abbeville County, "catfish farming".....	189-190	Smith County, farmers go to grass.....	19-22
close-drilled corn for silage.....	71	Terrace(s)—	
conservation song for schoolchildren.....	275	Club Gets Results. Martin Max Hawk.....	283
drainage improves mail service.....	71-72	parallel—	
Fairfield County, erosion scars healed.....	3-5	before field rearrangement. Cover picture..	[266]
parallel terracing.....	268-270	new conservation tool.....	268-270
Pickens, watershed program brings more		Terraced Fields, A New Look For. James J.	
honey.....	204	Coyle.....	268-270
Sumter County, reclaiming mined land.....	142	Terracing—	
South Dakota—		for soil protection and wildlife (Pa.).....	184
cattle more profitable than wheat.....	42-43	increases moisture storage.....	200
Sully County, range and wildlife manage-		practices, progress in 1960.....	161
ment.....	184-185	TEUSCHER, HENRY: The Soil and Its Fertility.	
tree-planting programs aided by estimating		With Rudolph Adler and Jerome P. Seaton.	
stock needs.....	246-247	Review.....	95-96
SPANNAGEL, TRUMAN G.: Dam Overhauled By		Texas—	
"Arctic" Engineering. With Harold W.		bankers finance SCD supervisors' trips.....	263
Bradford.....	270-272	controlling excess water in woodlands.....	43-44
STEAD, WILLIAM H.: Natural Resource Use in		Carl E. Hicks, District Profile.....	166-167
Our Economy. With George L. Fersch.		geologic investigations pay off.....	273
Review.....	191	Lubbock, tests on soil temperature and cotton	
Stobbe, Dr. P. C., warns of Canadian land-use		planting time.....	168
problems.....	262	management training sessions create new	
STODDARD, CHARLES H.: Land For the Future.		spirit for SCS employees.....	81-83
With Marion Clawson and R. Burnell Held.		mulching flood prevention structures.....	38-39
Review.....	143	pine trees replace cotton.....	252-254
Streambank Stabilization, Early. Paul Tabor..	46	Rio Hondo, Boy Scouts carry out conserva-	
Strip Mine Becomes Wildlife Haven. Ernest		tion plan.....	65-66
Dierks.....	175-176	Tilden, more quail and deer.....	188-189
Stripcropping—		woodland clinics for youth.....	254
halts wind erosion (Mo.).....	68-69	Youth Range Camp.....	132-133
provides wildlife habitat (Pa.).....	183-184	They Learn About Their Soil Maps By Reserva-	
Structure(s)—		tion Only. R. W. Eikleberry.....	109-111
design improvements at St. Anthony Falls		Things To Do in Science and Conservation.	
Hydraulic Laboratory.....	280-282	Review by Alfred E. Beaty.....	192
flood-prevention, fertilizing by airplane.....	213	THOMPSON, EVAN C.: District Profile, James	
grade-stabilization and floodwater-retarding		E. Nesson of Utah.....	94-95
(Nebr.). Cover picture.....	[194]	Thorn Creek Cattlemen Work Together. J.	
in conservation planning.....	267	Boyd Price.....	136-138
Watershed, Call For Major Engineering Plan-		Thornburg, Howard B., puts accent on youth..	93-94
ning. Eugene C. Buie and Carroll A.		Tile—	
Reese.....	276-278	drain, better quality.....	161-162
Stubble—		drainage improves bulb land (Wash.)... ..	286-287
burning costs money.....	167	TOSSETT, OTIS: Land, Water & People. As-	
Mulch Farming. Walter E. Selby.....	176	sisted by Joe Douthit. Review.....	288
mulching increases absorption of rainfall.....	155	Tree(s)—	
SWANSON, ROBERT E: Pipe Replaces Ditch..	129	acres planted on Certified Tree Farms.....	88
SYLVESTER, DONELL D.: Sandhills Ranchers		and shrubs fit into the conservation farming	
Go For Trees. With Lorenz F. Bredemeier		pattern. Cartoon.....	249
and Walt Ekdahl.....	250-251	conservation on farm woodlands.....	243
TABOR, PAUL: Early Streambank Stabiliza-		Crops To Fit the Land. T. B. Plair.....	248-249
tion.....	46	farms in the U.S., 1961.....	249
Take Half and Leave Half. Horace L. Leit-		Farming, Conservation, Is a Way of Life With	
head.....	125-127	the Wilsons. Herbert F. Gaines.....	244-246
Taming the Pit River. Arnold E. Bullock....	210-211	fit into conservation pattern. Cover picture..	[242]
Tennessee—		heal erosion scars (S. C.).....	3-5
Dyer County, living fences for wildlife.....	190-191	Pine, For Cotton—Sound Land Use, Profit.	
Jefferson County, soil stewardship activ-		Dan Boone and Claude K. Compton.....	252-254
ities.....	234-235	planting—	
Johnson Creek watershed, flood prevention..	140-141	by private landowners, 1960.....	254
nonfarm income of rural families.....	92	for wildlife (S. Dak.).....	185
		in Nebraska's sandhills.....	250-251

Tree(s)—continued	Page	Water—Continued	Page
planting—Continued		supply—continued	
on spoil banks (N. Dak.).....	175-176	making best use of. Quotation.....	[74]
stock needs estimates aid program efficiency		use—	
(S. Dak.).....	246-247	in the U.S.....	96
to stabilize sand dunes (Mich.).....	12-14	seasonal, and efficiency for production.....	118
Seeding By Helicopter. M. P. O'Keefe....	91-92	Watershed(s)—	
species controlled with herbicides.....	57-59	Bear Creek (La.), fertilizing structures by	
Won't Grow Just Anywhere. Lester Fox..	258-259	airplane.....	213
Trout Pond in Virginia. Wayne M. Hypes..	179-180	Brownell Creek (Nebr.), structures and land-	
TURNER, TOM: Hay Production Increased 7-		treatment measures. Cover picture.....	[194]
fold, Cattle 10-fold.....	27-29	Congress, National, 8th annual.....	216
Utah, James E. Nesson, District Profile.....	94-95	Elk Creek (Ind.) solves flood problem.....	199-200
van Leer, Hans L., of Massachusetts, District		Fellsmere (Fla.), flood-damage studies.....	201-203
Profile. Lester Fox.....	215-216	Gering (Nebr.), women on steering	
Vermont, Addison County, marsh development		committee.....	212-213
for wildlife.....	174-175	hydrologic studies (Ohio).....	208-210
Virginia—		In Colorado, Kiowa Serves As Pilot For.	
Bath County, farm pond for trout.....	179-180	Herbert I. Jones.....	196-198
Fairfax County helps complete soil survey..	104-105,	Johnson Creek (Tenn.), flood prevention...	140-141
107		Natural Units for Conservation Programs.	
SCD Association: Conservation Help For		Donald A. Williams.....	195
Builders, Developers, and Contractors.		pilot projects, progress in 1960.....	163
Review.....	288	program helps honey production (S.C.).....	204
VAN ARSDALL, H. E.: Tall Fescue—A Winter		Projects—	
Grass For Florida. With LeeRoy Wiggins..	235-236	Local Financing of. John I. Kincaid...	203-204
WALKER, RAY: Oklahoma District Sponsors		progress in hydrologic aspects.....	162
Water Safety.....	205-206	Small, Better Hunting and Fishing on.	
WALLACE, MERVIN H.: Wheatgrasses Do a		Fish and Wildlife Service. Review.....	288
Job.....	237-239	Sebastian River Drainage District (Fla.),	
WARNER, HENRY: Path Valley's Green Acres.		flood-damage studies.....	201-203
With William Hayes.....	230-231	Structures Call For Major Engineering Plan-	
Washington—		ning. Eugene C. Buie and Carroll A.	
Clark County, tree seeding by helicopter....	91-92	Reese.....	276-278
Cowlitz County, conservation tree farming..	244-246	Waterways, Grassed, Boon to Kansas Farm.	
Grayland, cranberry operations.....	54-56	George R. Smith and Grant Woodward....	274-275
Moses Lake, cash crops to livestock.....	165-166	WEAVER, RICHARD L.: Manual For Outdoor	
Palouse country, building soil with grass...	111-112	Laboratories. Review.....	47
Pateros, dragline irrigation.....	84-85	Weed(s)—	
Puyallup Valley, improved drainage pays..	286-287	control—	
Wenatchee, geologic investigations save		begins with clean seed.....	204
money.....	273	in growing alfalfa.....	22
Washington Post & Times Herald, quotation on		with—	
Hugh Bennett.....	53	herbicides.....	56-59, 69
Water—		oat-straw mulch. Picture story.....	36-37
control on woodlands for better timber.....	43-44	over-the-row cultivation.....	255-256
developments for wildlife.....	172-173	depress yields.....	112
ground, supplies decrease in Great Plains...	211	Welling, Wendell, saves and uses runoff....	214-215
Hydrologists Keep Track of. R. G.		West Virginia, conservation education activi-	
Andrews.....	285-286	ties.....	93-94
Management System, New, Helps Louisiana		Wheatgrasses Do a Job For Arizona Rancher.	
Sugarcane Growers. Larkin B. Agnew..	278-279	Mervin H. Wallace.....	237-239
More Stock Watering Places. Mark E. Hill..	29-30	Whetstone, Guy V., reclaims mined land.....	142
Safety, Oklahoma District Sponsors. Ray		WIGGINS, LEEROY: Tall Fescue—A Winter	
Walker.....	205-206	Grass for Florida. With H. E. Van Arsdall..	235-236
supply—		WILBUR, EDWIN C.: Better Woodland Through	
estimates aid farm planning.....	115-116	Water Control.....	43-44
forecasting and snow surveys, progress		Wildlife—	
report.....	162	abundance results from what we do with the	
improved by gully-control work (Kans.)..	274-275	land. Quotation.....	[170]
		and Range Management on a South Dakota	
		Ranch. Robert O. Koerner.....	184-185
		attracted by browntopmillet.....	34-35

Wildlife—Continued	Page		Page
Beaver Pond Grows Duck Food. Luther E. Gowder.....	182-183	Wilson family makes tree farming a way of life.....	244-246
Benefits from watershed project (Minn.).....	206-207	Wilson, Jim, turns from grain to livestock.....	231-232
Better Hunting and Fishing on Small Watershed Projects. Fish and Wildlife Service. Review.....	288	Windbreaks—	
"catfish farming" (S.C.).....	189-190	bring increased yields (Nebr.).....	155
conservation—		improved design, introduced in Great Plains.....	160
in rural areas, progress report.....	160	keep the cows out. Cartoon.....	256
in the Soil and Water Conservation Program. Donald A. Williams.....	171	one or two rows effective.....	251
deer—		provide wildlife habitat (N. Dak.).....	247
and cattle, a conservation plan for.....	177-178	weed control with—	
overlooking ranch. Artwork by Lyndle Dunn.....	177	herbicides.....	69
ducks attracted by farm ponds.....	5	over-the-row cultivation (N. Dak.).....	255-256
Farming in Oregon. Henry J. Pavelek.....	172-173	Wisconsin—	
finds a home on replanted spoil banks (N. Dak.).....	175-176	soil test improvement.....	114
good hunting on conservation farms.....	184, 256-257	Stratford, parallel terraces. Cover picture.....	[266]
Likes His Windbreaks.....	247	Vernon County, aerial view of landscape. Cover picture.....	[2]
living fences provide food and cover (Tenn.).....	190-191	WISNER, GAYLORD H.: Conservation Farmers Halt Missouri's Little Dust Bowl.....	68-69
marsh development (Vt.).....	174-175	Woodland(s)—	
more pheasants through Great Plains plan.....	187-188	Better, Through Water Control. Edwin C. Wilbur.....	43-44
More Quail and Deer on a Texas Ranch. Joe Coughran.....	188-189	Clinics For FFA-4-H Boys. Leo L. Fisher.....	254-255
New Home for Ducks. Wayne A. Ruona.....	186-187	erosion-control measures (Calif.).....	262-263
policies of the Soil Conservation Service.....	171	Farm, Conservation on. Donald A. Williams.....	243
quail browsing on improved range. Cartoon.....	178	management data gathered by farmer (Ind.).....	168
raccoon emerging from undergrowth. Cover picture.....	[170]	rating soils for wood crops, progress report.....	160
waterfowl wetlands acquired by Fish and Wildlife Service.....	173	soil suitability key to profitable tree crops.....	248
Without Man—Man Without Wildlife. Cartoon.....	192	southern, livestock production on.....	144, 161
woodland water control provides habitat (Tex.).....	44	WOODWARD, GRANT: Grassed Waterways Boon to Kansas Farm. With George R. Smith.....	274-275
WILLHITE, FORREST M.: Mountain Meadow Improvement. With Hayden K. Rouse.....	134-136	WORTHINGTON, ELMER L.: Over-the-Row Cultivation Speeds Tree Care Job.....	255-256
WILLIAMS, DONALD A.—		Wyoming, last Case-Wheeler Project completed.....	162
Conservation—		YARLETT, L. L.: Range Management in Florida.....	130-132
Bivouac—The Fifth Boy Scout Jamboree.....	[60]-63	Yield increase—	
on Farm Woodlands.....	243	through—	
Engineering Measures in Farm and Watershed Conservation.....	267	alternate-row seeding.....	89-91
Farm and Ranch Planning—The Base for Full Conservation.....	147	conservation farming practices.....	7-8, 148
Grass Crops in the Soil and Water Conservation Program.....	219	improved grasses, better irrigation, land leveling.....	27-29
New Methods for New Problems.....	75	land selectivity.....	20
quotations—		meadow renovation.....	127-128
objective of conservation planning.....	[146]	mulch planting. Picture story.....	36-37
on Hugh Bennett.....	53	stand improvement (Nev.).....	226-227
Range Conservation.....	123	stubble mulching, weed control, fertilization.....	155
report of SCS activities, fiscal year 1960.....	158-164	terracing (Iowa).....	283
Soils—The Key to Proper Land Use.....	99	use of windbreaks.....	155
Watersheds—Natural Units For Conservation Programs.....	195	water management.....	117-119
Wildlife Conservation in the Soil and Water Conservation Program.....	171	YOUNG, C. W.: Browntopmillet For Wildlife. With Morris Byrd.....	34-35
WILLIAMS, ROBERT E.: Livestock Production on Southern Woodlands.....	144	Youth—	
		Put the Accent on. Bernhard A. Roth.....	93-94
		Range Camp in Texas. Rudy J. Pederson.....	132-133
		Zavisch, Harry, improves pasture, has more quail and deer.....	188-189
		Zoning To Protect Agriculture. Erling D. Solberg.....	76-78

AUGUST 1960

Soil Conservation



SOIL CONSERVATION SERVICE • U. S. DEPARTMENT OF AGRICULTURE

CONTENTS

VOL. XXVI, NO. 1

AUGUST 1960

"Soil conservation districts have had tremendous impact upon American agriculture. They are changing the landscape of America into a pattern of utility and beauty."

—SENATOR JAMES E. MURRAY

PAGE

- 3 Pastures, Pines, and Ponds
By Barrington King
- 6 Good Leadership of District Supervisors
By A. B. Foster
- 9 Livestock to Dust to Livestock
By David O. Davis and Paul N. Miller
- 12 Saga of the Sand Dunes
By Kent Alverson
- 15 19 Years of Conservation Pays
By Herb Boddy
- 17 Two-Way Radio Speeds Conservation Work
By Herbert I. Jones
- 19 Farmers Go to Grass
By Leon J. Sisk
- 22 A Book Designer Turns Conservationist
By Lester Fox



COVER PICTURE.—Aerial view of a landscape where utility and beauty are combined, in the Vernon County Soil Conservation District of Wisconsin.

—Photo by Erwin Cole

Soil Conservation

EZRA TAFT BENSON
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

TOM DALE, Editor

15 CENTS PER COPY

FOREIGN—\$2.25 PER YEAR

\$1.50 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Pastures, Pines, and Ponds

Heal Erosion Scars of Fairfield County

By Barrington King

VISITORS who travel the main highways or county roads of Fairfield County, S. C., see few tilled acres. But they see a seemingly endless expanse of pastures and pines. Dotting the landscape are hundreds of farm ponds—ponds that farmers have built to provide water for their growing herds of dairy and beef cattle.

It is difficult to imagine, therefore, that when Hugh H. Bennett wrote his famous "Soil Erosion, A National Menace" in 1928, he cited Fairfield County as an outstanding example of land destruction through misuse. Of conditions there he wrote:

"A single county in the southern part of the Piedmont Region was found by actual survey to contain 90,000 acres of land, largely cultivated at one time, which has been ruined by erosion. The whole area has been dissected by gullies, and bedrock is exposed in thousands of places. Here and there islands or peninsulas of arable land have been left between hideous gullies, but most of the remnants are too small to cultivate."

In warning that "the extent of this devastation is yearly growing larger" he added, prophetically, that the land still had value for growing pines and for pasture. It is these two conservation uses that have so transformed the landscape of Fairfield County.

The larger gullies are still there. They can be seen in the reforested areas if you take the trouble to



Severe gully erosion that was typical of much of Fairfield County when this picture was taken in 1937.

search them out. But today these gullied areas are producing valuable pine timber and pulpwood. And the tree growth is slowly but surely healing the scars of erosion that were so evident on the landscape 30-odd years ago.

In this issue of **SOIL CONSERVATION** are stories on the history and achievements of six soil conservation districts in widely scattered parts of the United States. We consider these districts and their accomplishments more or less representative of the more than 2,900 districts of the Nation, except that all six of them were among the first districts organized in their respective States. Hence, their achievements should be, and probably are, greater than in most of the newer soil conservation districts. The first of these stories begins on this page.

—Editor

The tree planting program was started during CCC camp days. The camp at Parr Shoals was one of the first erosion-control camps in the entire country. This camp and another at Winnsboro planted more than a million pine trees a year in Fairfield County from 1935 through 1941.

S. D. Catheart, chairman of the board of supervisors of the Fairfield Soil Conservation District and director of a bank in Winnsboro, recalls those days. Back then, he says, tree planting wasn't too popular, even though the Federal Government furnished the trees and the CCC boys planted them. "I wasn't too enthusiastic about it myself when they planted pines on my place," he admitted. "But if we had gone on as we were headed, this county would have been finished in another 50 years.

Note:—The author is information specialist, Soil Conservation Service, Spartanburg, S. C.



Fairfield County's future farmers help in the district program.

"Nobody took much interest in cattle," he continued. "We just let the few cows we had graze the woods. In 1938, I took 25 or 30 acres out of cultivation and fertilized it for pasture. That was the first real pasture I had."

In 1938 Fairfield County joined 3 other counties and organized the Catawba Soil Conservation District. Then in 1950 the Catawba district was divided and Fairfield County became a district in itself. Tree planting remained a prominent part of the district programs, even after the CCC camps were liquidated during World War II. And the district program was expanded to include all types of modern conservation practices, especially the development of improved pastures and farm ponds.

Operators of more than 800 of the 1,500 farm units in the county are cooperating with the Fairfield Soil Conservation District. In recent years they have planted more than 11,000 acres to pines, 15,000 acres to improved pasture, and have built 560 farm ponds, as a part of their farm conservation plans developed with the help of SCS technicians assigned to the district.

Livestock numbers have increased steadily with the development of improved pastures. Current reports show about 4,500 dairy cattle, 8,000 beef cattle, and 4,500 hogs.

The county's 37 Grade-A dairies last year sold 4 million pounds of milk for \$329,000. Income from beef cattle was even higher than that, but the exact amount is difficult to estimate. In the last four or five years, a new local market that buys 250 hogs a month has revived interest in purebred hogs.

There are 16 sawmills and 3 planing mills operating in the county, employing 324 people. The annual capacity of all the mills is 40,845,000 board-feet of lumber.

Pulpwood has become a 1½-million-dollar industry. It has far outstripped cotton as the county's principal cash crop. In recent years, annual production has exceeded 100,000 cords.

Pulpwood and pastures require less labor than cotton and other row crops, which means that Fairfield has lost some of its labor force in recent years. But from the land use standpoint, the change was inevitable.

S. M. Stevenson, a banker who also operates a large farm and is a supervisor of the Fairfield SCD, has observed the changes from the standpoint of one directly concerned with both the financial and the conservation developments in the county.

"We used to handle primarily cotton loans that came due in the fall," he explained. "We do practically none of that now. Farmers have converted to dairy and beef cattle and pine trees. We also have several large turkey farms in the county. Farmers as well as their land are in better shape."

This feeling that developments on the land are definitely improved is general among civic leaders in Winnsboro. Equally definite is the belief that the time is ripe for industrial development in the county to match the progress on the land.

This is emphasized particularly by G. M. Ketchin, editor of the *News & Herald*, who has lived in Winnsboro since 1934. He is keenly aware of the improvements on the land. On the other hand, he points out, the industrial expansion hasn't been sufficient to take up the slack in farm employment that goes with the more extensive type of agriculture.

But the vigorous campaign he is carrying on through the editorial columns of the local paper seems certain eventually to bring about the balance of agriculture and industry that county leaders are seeking. They are convinced that proper land use provides a sound basis for such development.



Pastures and ponds, such as these, are an integral part of the present landscape of Fairfield County.

The various agencies and groups operating in the county are adapting their programs to the land use changes that have occurred. J. D. Lyles, county supervisor of the Farmers Home Administration, says his agency is giving more emphasis to timber and pulpwood in its appraisals and farm management plans. "All borrowers whose loans are for more than five years," Mr. Lyles stated, "are required to have a soil conservation district plan on their land."

ACP cost sharing has helped make the widespread land use changes possible. ASC county office manager W. Banks Patrick said ACP has shared in construction costs of all ponds which met requirements for livestock water and irrigation, estimated as 90 percent of the total ponds; 75 percent of the terracing; and a large part of the pasture planting and tree planting.

"What has been accomplished has been brought about by all the agencies and groups working together," Mr. Patrick summarized. "But we shouldn't overlook the tremendous part that nature herself has played in the healing process. We're just working together now in harmony with nature."

The wildlife benefits of conservation farming are one of the features that appeals most to Dave Crawford, chairman of the newly organized Wateree Watershed Conservation District. As a part of his farm conservation plan he has built 8 farm ponds, primarily to provide water for his 175 beef cows. But ducks come to the ponds by the hundreds, he reports. He also has planted eight strips of bicolor lespedeza for wildlife food.

As chairman of the watershed district, which is sponsoring a watershed protection and flood prevention project on Wateree Creek, Mr. Crawford reports that about 90 percent of the 35,000 acres in the watershed is in pines and pastures. That type of land use provides just



One of Fairfield County's two pulpwood yards, where farmers now find as ready a market for their trees as they once had for cotton only.

about ideal cover for the watershed lands, he points out. But infiltration rates of the soils are low and runoff is high, in spite of the excellent ground cover. So four flood detention dams and three miles of channel improvement work will be needed to supplement the land treatment measures.

But floods aren't the only problem on Wateree Creek. In 1954, the creek bed was completely dry for four months, Mr. Crawford reports. "If we didn't have farm ponds, we couldn't be in the livestock business," he emphasized. "We haven't got nearly enough ponds yet. Instead of the 560 we have in the district, we ought to have 2,000."

One of the most striking examples of the changes that have come about in Fairfield County is related by R. M. Blair, member of the County ASC Committee and a supervisor of the Fairfield Soil Conservation District. He owns about 5,000 acres of farmland, much of which formerly was planted to cotton. Today about 90 percent is in pines. He has 250 acres of pasture, watered by nine farm ponds, and keeps around 150 head of beef cattle.

"I was talking to my brother the other day about the old home place, where Daddy used to have

16 families on 500 acres," he recalled. "The land was getting pretty eroded, and he'd plant cowpeas on it to protect it. But every time he'd plow it, it would wash more."

Mr. Blair grows only 15 acres of cotton. It is on two farms where he has a 48-acre cotton allotment. The only other row crops he has are on 125 acres of bottomland along the Broad River, where he grows feed.

"My bottomland is much safer to farm than it used to be," Mr. Blair says. He attributes this to soil conservation work on the upper reaches of the Broad River watershed and its tributary streams.

"Because of floods, Father used to count on losing every third crop of corn on the bottomland," he added. "I've planted corn on the same bottomland for the past 11 years and haven't lost a crop. I think that's one of the best examples I know of the value of soil and water conservation."



The strong trend to heavier nitrogen fertilization and reduced use of lime over the past decade is making soils more acid, according to USDA surveys.

Knox County Revives Through Good Leadership of District Supervisors

By A. B. Foster

THE Knox County Soil Conservation District in Indiana owes its success to outstanding leadership of the district governing body more than to any other single factor.

It is significant that the first board of supervisors elected in 1940 was made up of farmers who were strong leaders and were outstanding farmers with prestige. This same pattern has characterized every supervisor from that time until now.

"The district's conservation program seemed to spread through efficient farmers—farmers who were doing a pretty good job but who wanted to do better. It is inefficient farmers who have ignored the program—and not all of them have." This is the studied opinion of present members of the Board and concurred in by several other

farmers, some of whom have served on the Board.

Knox County is located in southwestern Indiana between the Wabash and White Rivers. It was one of the first counties in Indiana to be settled and farmed to any degree. Because of this early settlement and a type of soil that is particularly erosive, the decline of the land was severe and extensive.

Most of the soils are of a type, however, that responds to good treatment. Once good land use and proper conservation practices were applied, even the worst-eroded soils have proven to be highly productive. And good land use and conservation are becoming the rule on a great part of the county under the district's conservation program.

The chief problems—drought, erosion, and poor drainage—still exist on the farms that have not yet adopted conservation plans. Erosion and drainage have been



Typical erosion on Knox County land before conservation treatment.

solved on the farms of the cooperators and drought hazard has been greatly reduced as a result.

Out of 1,665 operating units in the county there were 1,021 district cooperators with 805 basic conservation plans as of January 1, 1960. Of 302,546 acres of agricultural land in the district, 111,000 are covered by these basic plans. A total of 150,627 acres is included in the land owned or operated by the cooperators.

Among the accomplishments on the land are 509 miles of terraces; 572 ponds; 126 miles of diversion terraces; 32,703 acres of conservation crop rotations; and 271 miles of tile drains and 161 miles of open drains on over 16,000 acres of highly productive bottomlands which high water and flooding had previously rendered almost useless.

Former county agent H. S. Benson led the movement to get the district organized, the second in Indiana. His argument for the formation of the district revolved around open ditch drainage on the



Board of supervisors of Knox County SCD: (left to right) Ernest Miller, chairman, Harold Miller, Winton Palmer, Perry Jackson, and Paul Sprinkle.

Note:—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.

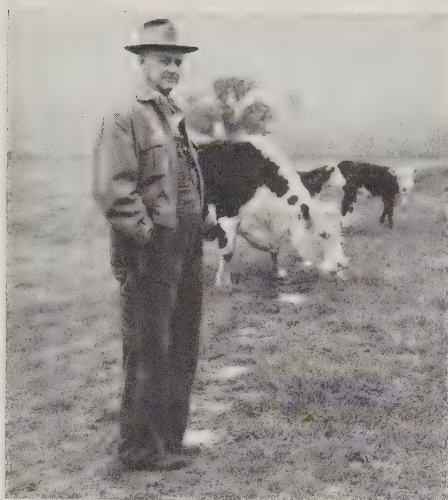
small bottomlands. He contended that farmers were wasting money by continually redredging ditches that kept filling up with soil washed from their upland fields. He saw that the only solution was an adequate erosion control program. After the district was organized he gave it the full support of the Extension program in the county. This has been true of the Extension workers who followed him.

From the beginning, results from conservation work were spectacular, and the effect on land values was almost fantastic. The first step taken by most cooperators was to build terraces, or a combination of terraces and diversions, to head off water that rushed down the long gentle slopes. This runoff not only damaged the upland, it made fertile bottomland fields too wet to farm. Grassed waterways were of course included; and lime, fertilizer, crop rotation, residue management, and contour operations completed the picture. More recently, minimum tillage is coming into prominence. A significant change in use of pastures was brought about by the building of farm ponds where lack of stock water had always been a problem.

Interviews with cooperators and supervisors indicate how successful the program was.

Bert Shake was one of the first cooperators. He bought 150 acres in the early 1940's, two-thirds of which was so badly gullied it could not be farmed at all. After applying the practices described above and filling the gullies he now raises 40 to 50 bushels of wheat per acre. He named farm after farm in his neighborhood where he said the value of the land would not be half what it is if a conservation plan had not been applied.

In 1946 George Kerns bought 175 acres, paying \$70 an acre for 123 acres, \$35 an acre for 12 acres, and \$125 an acre for 40 acres. The land would not support the 11 cows he then had. He now has a herd of 108 dairy cows and 40 heifers and



Lester Williams, member of the first board of supervisors of Knox County SCD, in one of his terraced fields.

was recently offered \$400 an acre for the entire farm but refused to sell. Without his conservation plan he said his land would look like that of a neighbor he pointed out who was having trouble paying taxes.

Perry Jackson, a supervisor who has been on the board for 9 years, showed us some land that he paid \$70 an acre for in 1937. He has refused \$400 an acre for it. He figures that inflation would have increased the original value about threefold, which would have raised it to \$210. The rest he credits to the conservation program.

W. S. Carnahan bought 140 acres in 1957 for \$138 per acre. He spent less than \$800 for terraces, diversions, and waterways. Now, 3 years later, he claims he could easily sell the farm for more than \$250 per acre. A 20-acre bottomland field on this farm, according to the previous owner, "would never be any good." It was always too wet in the spring to plant and stayed too wet to harvest a crop, if there was one, in the fall. After proper drainage, the corn yield on this field in 1958 was 87 bushels per acre. In 1959 it produced 42 bushels of soybeans per acre.

Winton Palmer, a district supervisor, says his conservation plan has doubled his farm's value in 10 years. Palmer believes that 90 percent of the land that changes hands now is being bought up by district cooperators. "They are the only ones with money to buy it. And they know what they can do with so-called 'worn-out' land when they get hold of it," he said.

Harold Miller, another supervisor, was the most enthusiastic of all in evaluating the effects of the soil conservation program on the land. He believed that it increased production by 4 or 5 times, and gave his own experience to prove it. Land that yielded 10 bushels of wheat per acre now produces 50 to



Fescue grass waterway on the Winton Palmer farm of Knox County.



Terrace construction on the Perry Jackson farm in Knox County.

60 bushels. And corn yields have jumped from 25 to as high as 125 bushels per acre.

Andrew Martindale is an orchardman with 135 acres of orchard, all terraced. Formerly the fields were dry, due to the rapid runoff of water. Now, with the terraces, there is little runoff even in the hardest rains. Fruit yields are much higher. Two ponds, which were built to heal gullies, provide water for spraying.

"My less eroded land has increased 25% in value and the

steepest land at least 100%," Martindale insisted.

Lespedeza was the main crop for pasture and hay before the district was organized. There was very little, if any, red clover. Now crop rotations that include red clover are standard. Acreage of lespedeza cut for hay has dropped to 747 with a total harvest of 854 tons. Alfalfa production rose from 4,183 acres and 9,863 tons in 1940 to 6,504 acres and 14,928 tons.

All of these improvements out on the farmlands of the district also



Terraced peach orchard with grass cover crop on the Andrew Martindale farm in Knox County.

show up on the balance sheets at the banks in the towns; and they show up on the census reports and other places where figures talk.

According to agricultural census reports, cash farm income rose from \$3,445,863 in 1940 to \$13,991,041 in 1954, the latest available figures. Bank deposits at the American National Bank in Vincennes rose from \$4,236,335 in 1940 to \$16,659,125 in 1959. At the Security Bank and Trust Company, deposits were \$4,037,683 in 1943 and \$12,018,997 in 1959.

The outstanding leadership of the district supervisors, the high caliber of farmers who became co-operators, and the excellent quality of the technical assistance furnished by the SCS were all major factors in the success of the district. But we cannot overlook the fact that complete endorsement of the district's program was given by other organizations.

The two banks in Vincennes contribute money regularly to finance air tours and to publish annual reports of the district. The Vincennes Kiwanis Club took an early interest in the district and sponsored the first county terracing contest, later sponsoring the first Statewide terracing contest.

The Knox County Farm Bureau Cooperative has consistently been a strong backer of the district. The county Extension program has given the district program strong support through its educational activities. The Farmers Home Administration has required conservation plans on the farms on which loans have been made to buy the land. The county highway department and the county supervisors have cooperated on work involving roads and bridges. These wholehearted cooperative efforts have helped make the job easier. Yet, we still must give the main credit to that group of outstanding farmers who helped organize the district and served on its first board, and the other leading farmers who have succeeded them.

Union County Swings from Livestock to Dust to Livestock

By David O. Davis and Paul N. Miller

THE Northeastern Soil Conservation District covers about 2,256,000 acres in Union County, New Mexico. The district was first organized in 1938, and included only the northeastern part of the county. Since then there have been nine additions until it now covers all of the county except for about 200,000 acres that are included in the East Colfax, Ute Creek, and Mesa SCD's.

Union County is in the northeastern corner of the State. Settlement first started around 1880, and in 1893 it was formally declared a county of the Territory of New Mexico. It was strictly cattle country at that time, and remained so until the Homestead Act took effect around the turn of the century. Even after that cattle grazing was the principal business; but a considerable part of the grassland was homesteaded, first in 160-acre tracts, and later in 320-acre tracts. The height of settlement was reached around 1916.

Early crops grown included corn, small grains, beans, and fruits—sorghums were introduced later. Wheat, corn, and beans were profitable crops during years of above-normal rainfall if planted on the better soils. During normal and drought years, however, even these crops often were unprofitable and crop failures were frequent. Hence, many of the homesteaders found it impossible to make a living from the meager homestead acreage. They either sold out and left or supplemented their income by buying



Farmstead in Northeastern Soil Conservation District: (above) at the time farm and farm home were abandoned in 1936; (below) the same farmstead, with new farm home, in 1959.



more land or working part time for the cattlemen and others.

The population of Union County gradually declined, from a high of nearly 20,000 in 1916 to about 11,000 in 1930. Then the long drought struck in 1931 and the remaining inhabitants soon found themselves in the heart of the "dust bowl." And, as usually happens, hordes of grasshoppers came with the drought.

The northeastern part of the county, where most of the homesteaders had proved their claims, was especially hard hit by the protracted drought. Soil blowing started on some of the cultivated fields during the first years of the drought. As drought continued the soil blowing spread to most cultivated fields and to much of the overgrazed grassland. Several inches of topsoil was swept from some formerly cultivated fields. In

other fields and ranges hummocks of silt and sand piled up to smother vegetation and obstruct tillage. Sand dunes were forming in many localities. More than 250,000 acres in the county were damaged by wind erosion before the drought ended in 1940.

By this time many ranchers thought that most of the range grasses were dead. Many farmers thought that most of their cultivated land was ruined for further practical use. Indeed, many grass plants did succumb for lack of water and overgrazing. And some of the shallow soils that should never have been plowed in the first place were rendered unfit for further cultivation. But the situation was not hopeless.

In 1935 one of the early wind erosion control demonstration areas of the Soil Conservation Service was started in Union County. A Land Utilization project was started in 1937, under which about 57,000 acres of the worst wind-blown land was purchased by the Federal Government by 1940.

At the time the Northeastern district was organized in 1938, things looked pretty grim to most of the cattlemen and farmers who were still trying to hang on and salvage some of their holdings. Most of the inhabitants who felt they could had already left for California or other places where they didn't have to breathe and eat dust all day long during the windy seasons.

By this time, however, some of the lands in the SCS demonstration area were showing signs of improvement, as proper land use and

Note:—The authors are, respectively, information specialist, Denver, Colo., and work unit conservationist, Clayton, N. Mex., both of the Soil Conservation Service.

water conservation practices were applied. Spots of rangeland also showed that all the grass was not dead and that these tough short grasses would recover where given a chance. As time went on it was shown that some of the better soils were suitable for permanent cultivation if the best soil and water conservation practices were used. It was mainly to spread such knowledge and get more universal application of the soil- and water-conserving measures that leading farmers and ranchers organized the soil conservation district.

The district program emphasized water conservation on both cultivated and range lands from the first. Terracing, contour tillage, and stubble mulching were the principal water-conserving practices advocated for cultivated fields. Water-spreading, contour furrowing, pitting, and pond construction were the main water conservation practices for rangeland. And irrigation developments and improvements were encouraged where practical. The Water Facilities Program of the Farmers Home Administration helped greatly on some irrigation and other water development practices, as did the cost-sharing payments of the ACP.

Flexible cropping systems were advocated, with sorghums, broom corn, and other drought- and erosion-resistant crops forming the



Broad-based terraces and contour tillage conserve water in Northeastern SCD.

core. Wind stripping was also encouraged, while stubble mulch tillage became a "must" in the district's conservation program.

For the rangelands, deferred grazing, rotation grazing, dispersed grazing, and proper stocking became standard practices to supplement the water conservation program. But even with these practices properly applied, a considerable amount of both rangeland and abandoned cropland sorely needed reseeding.

At the height of the homestead boom more than 300,000 acres of land were in cultivation in the Northeastern SCD. Some of this had been abandoned even before the drought of the 1930's. During

that decade about 46,000 acres were abandoned and left to blow or "go back" to weeds. Of the 57,000 acres purchased by the Federal Government under the LU program, nearly two-thirds was formerly cultivated land that was bare of permanent vegetation. Revegetating these bare lands presented quite a problem, and has been a major objective of the district ever since its organization.

Since 1940 about 127,000 acres of former cropland have been planted to grass in the Northeastern district. About 35,000 acres of this "go back" land is Federally owned on the Land Utilization project; the remaining 92,000 acres is privately owned land, some of which is in the Conservation Reserve of the Soil Bank.

The Federal lands on the LU project have been a principal source of grass seed for the revegetation work in the district. In 1958 nearly 35,000 pounds of grass seed were harvested from the LU lands and made available for reseeding conservation reserve and other land.

The reseeded lands now provide some of the best grazing to be found in this area; some of these new ranges produce much more forage than the native ranges. But nearly all ranges in the Northeast district now produce more forage



Grain sorghums are used extensively in all cropping plans for Union County farms, because of their resistance to drought and wind erosion.

than at any time since early settlement. This is due mainly to the water conservation work and better range management. There has been what almost amounts to a revolution in the ways of thinking of the average stockman in this district. He now measures the production of his range in pounds of beef rather than the number of cattle he can run on his range.

The cultivated lands still under the plow are more productive, too. They are chiefly on the better soils and most of them are farmed according to the district conservation program. Also, around 40 irrigation wells have been drilled in recent years. These add considerably to the agricultural output of the district. All in all, Union County is now in better shape and has a more stable agriculture than at any time since the homesteaders began to arrive in large numbers.

The conservation work in the Northeastern district received a good test in the early 1950's, when a drought almost as severe and long as that of the 1930's came. This brought much hardship to the area. A reduction in cattle numbers was forced on most ranges and many ranchers had to buy feed or market poor cattle at a loss. Some crop failures occurred on many cultivated fields. And there was some dust in the air, while occasional fields blew severely. Times were hard. But there was no general recurrence of a dust bowl and no great exodus of inhabitants as in the 1930's. Most farmers and ranchers stayed on their land and fought through until the rains came again.

In 1960 there were 680 landowners in the Northeastern SCD. Of these, 470 were cooperators with the district. Their district agreements covered 1,882,962 acres. Of these cooperators, 348 had developed basic plans that covered nearly 1,500,000 acres.

The Great Plains Conservation Program has given quite a boost to the district program recently. During the first two years of its opera-

tion, 28 district cooperators signed Great Plains contracts, and 40 others applied for such assistance. These Great Plains contracts are generally an acceleration of treatment and a revision of the district agreements previously signed. This program offers a sure and dependable means of cost-sharing to finance the needed conservation improvements. It should help greatly in speeding up the total conservation job.

The conservation needs in Northeastern SCD still are great. But progress has been accelerating in recent years. Application for watershed protection and flood prevention work has been made for 12 water-

sheds in the district. Operations are underway in one project—the Tramperos Creek watershed. Six other projects already approved by the State engineer include one with planning going on now, and two others with planning to begin this year. These projects should give further acceleration to the program, especially in the water conservation phase.

More important is the attitude of the district supervisors and the conservation ranchers and farmers. They realize that droughts and grasshoppers will plague them again. But they think they have most of the answers for these twin evils—and they fully expect to find the answers they lack. They are now surer than ever that they can live and farm and ranch successfully in Union County. And they are determined to finish the conservation job and complete the swing from livestock to dust and back to livestock.

Nitrogen Key to Continuous Cropping

Ohio Experiment Station cropping studies over a six-year period indicate that corn could be grown every year where soil erosion is not a problem if adequate nitrogen fertilization is used.

At Wooster, continuous corn with nitrogen averaged 87 bushels over the 6-year period as compared to 73 bushels for corn in a corn-wheat-alfalfa rotation without nitrogen. Corn in the same rotation with nitrogen added yielded 93 bushels. Yield varied seasonally, but showed no tendency to decrease under several years of continuous corn.

At the Northwestern Substation, corn yields with adequate nitrogen fertilization in a corn-bean rotation showed no tendency to decrease under this intensive cropping system. Corn yields without nitrogen decreased each year at both locations, emphasizing the need for nitrogen where corn does not follow a meadow crop with a good legume.



Revegetation of wind-eroded land in Northeastern SCD: (above) abandoned field, as it looked in 1937; (center) the same field covered with weeds and Russian thistle, in 1939; (below) the same field with good cover of grama grass, in 1959.

Saga of the Sand Dunes

West Ottawa farmers turn them green

By Kent Alverson

WASHINGTON Street in downtown Grand Haven, Mich., ends abruptly on the east bank of the Grand River. Across the river, in direct line with this "main" street, is a huge "mountain" of sand, sparsely covered with vegetation. This is Dewey Hill.

To the many tourists who drive through town toward Grand Haven's popular Lake Michigan beach, Dewey Hill is an eye-catching part of the scenery. To local residents, it is a symbol of a 20-year struggle to rescue lake-bound Ottawa County from the ravages of wind and water.

Until stabilized by community efforts, Dewey Hill was an active sand dune, dumping tons of sand into the river each year and threatening the city. Years ago, Grand

Haven started to develop on the west bank of the river. But sand pouring over the steep front slope of the dune began to cover buildings. The railroad tracks and station disappeared from view. Houses that could be saved were hauled across the ice of the Grand River in mid-winter. Now nothing remains on the west side but the dune itself.

Ottawa County in West Central Michigan formerly was a great lumber-producing area. After 1890, when most of the best timber had been stripped off, the soils produced a rich harvest of grains and fruits.

But the 8 inches or so of organic topsoil developed under timber cover was scant protection for the sandy parent material beneath. When plowed and exposed to the elements, it wasn't long before the thin layer of topsoil had blown or washed away. Prevailing south-

westerly winds piled up gigantic sand dunes near Lake Michigan. Sand from these dunes and from secondary lake beds, in a relentless eastward movement, engulfed thousands of acres of western Michigan land. By the 1930's, the west half of Ottawa County was being eroded by wind, the east half by water. Dust storms, sand blows, drought, and crop failures, along with the pitifully low prices for farm products, were driving farmers off the land.

As early as 1934, the county board of supervisors received complaints from farmers that the roads were being made impassable by the drifting sands. One railroad in the county used a snowplow during the dry season to clear the tracks of sand so the trains could get through. Many farms had become tax delinquent and had reverted to State ownership.

It was in this setting that the West Ottawa Soil Conservation District was formed, beginning with a campaign in the seven townships being most severely damaged.

The county supervisors were urging passage of a State enabling act and organization of a local district. Many local people and groups formed to support the idea. The State district enabling act was passed in 1937. In an enthusiastic referendum held in April 1938, landowners established their district by a vote of 808 to 11. West Ottawa was the first soil conservation district in Michigan.

A physical and economic survey of the seven townships in the original West Ottawa district was made in 1938. It showed net cash receipts

Note:—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.



Dewey Hill with present vegetative cover, left, with Grand Haven in the right background.

per farm varying from \$322 on the heavy soils to minus \$24 on the sand dunes. The percentage of outside income ranged from about 21 percent of total income on the heavy soils to 80 percent on the dunes. Corn averaged 32.6 bushels per acre on the heavy soils and 16.9 on the sands. Other crop yields showed a similar range and low production.

The report recommended public acquisition of land not suited to farming. It advised adjustment of land to its proper use, improved crop rotations, and practices such as wind stripcropping, windbreaks, cover crops, green manure crops, pasture management, a fertility program, and terraces where needed. The district's work plan followed closely the recommendations of the survey.

Effects of the district "rubbed off" on surrounding townships and counties. West Ottawa district spread over the entire county, while other districts were formed in adjoining counties.

Through efforts of the district, a Civilian Conservation Corps camp was set up near Grand Haven. During the 4 years of the camp's operation, CCC boys planted 4½ million trees, stabilized 2,500 acres of sand dunes, and improved many acres of existing woodland.

By 1944, many acres of former wasteland were beginning to show a profit. Thinnings from early tree plantings were sold and enough trees were left to assure good stands for a future lumber market. The new plantations on every hand were an added attraction to resort visitors.

Overall yields of crops in the district had increased 20 percent. New crops were being tried. Blueberries showed promise of becoming a major crop on sand flats with high water tables and sour soils. The "Peach Ridge" area of Ottawa County had joined the district. Farmers there began sodding their orchards to prevent erosion. In

October 1944 Robert Umlor said of the new practice, "It has already saved me many acres of orchards."

Up to this time the district was doing everything in its power to get more trees planted. The directors early recognized that the main obstacle to tree planting was an inadequate supply of available planting stock. Thus, in 1939 they started a district tree nursery. Much of the work was done by the directors themselves. District co-operators who were anxious to get on with the tree planting job were willing helpers. Financial assistance came from the county board of supervisors. This was the first district tree nursery in the State.

The nursery proved extremely successful and district cooperators soon were enthusiastically planting jack, red, white, and Scotch pine and Norway and white spruce, purchased at low cost from the district, at a rate of more than two million a year.

The district also was administering 6,200 acres of badly eroded "L.U." land, purchased in scattered parcels under the Bankhead-Jones Act, and 1,022 acres of county-owned land. Most of this land was "open blows" taken out of farming to protect adjoining land. (About 1953, all L.U. land



Revegetation of blown-out sandy land in West Ottawa SCD: (above) as the area looked in 1944; (below) after revegetation with beachgrass, in 1950. H. H. Bennett, former Chief of SCS, is shown in both pictures.



was transferred from SCS to the Forest Service, but the district still administers it under agreement with that agency.)

Townpeople got into the tree-planting act in a number of ways: through the schools and school forests, Scout and 4-H projects, and a community project to completely plant Dewey Hill.



Alfalfa pasture in West Ottawa SCD on land that formerly was severely eroded.

The district borrowed money to open up marl beds because most of the land in the district was sour and there was no ready source of lime. Later, when the AAA came along with its cost-sharing program (now under ACPS), the district stepped out of the lime and marl business.

By 1949, farmers had converted 13,000 acres from worthless sand to trees. Much of this land, formerly tax delinquent, was now paying taxes and increasing the wealth of the county.

District leaders then began to stress other phases of the conservation program. In 1953, the district established six erosion and runoff plots in Jamestown township to demonstrate loss of soil by improper methods of farming. More accent was placed on cover crops, striperopping, pasture improvement, wildlife area improvement, drainage, and irrigation.

The picture today is in striking contrast to the "dirty thirties." While there still is a need and a demand for tree planting, the west half of Ottawa County is definitely stabilized. As one resident said, "Our children have grown up in a forest."

Cover crops are being used on crop and orchard land. Agriculture is booming throughout the district. A recent report of Richard Machiele, local Extension director, stated:

"On the west side of the county . . . most of the land is now covered with beachgrass or has been planted to trees. Some district cooperators have planted tens of thousands of trees from which has sprung a tremendous Christmas tree enterprise . . . an estimated 1,500,000 Christmas trees have been sold this past season.

"The acid, low-lying Saugatuck and Newton sands have produced another industry . . . the production of blueberries. The 1,500 acres now planted produce a large gross income."

Land values have boomed. Planted blueberry land is valued at \$1,000 per acre. Land planted to trees varies from about \$100 to \$500 per acre according to its use and the volume of business from nursery stock, seedlings, Christmas trees, or lumber.

The last work report of the Soil Conservation Service shows it has helped 1,839 district cooperators with 127,196 acres of land. Some of the main practices installed to date include: Improved crop rotation, 70,180 acres; cover crops, 1,388 acres; striperopping, 7,440 acres; tree planting, 25,373 acres; windbreak planting, 234 miles; dune stabilization, 2,684 acres; hedgerow planting, 9,209 rods; and improved drainage, 10,576 acres.

Clarence Reenders, chairman of the Soil Conservation District

board of directors, summed up the present situation when he said:

"We are no longer concerned with submarginal land. That's pretty well tied down. Today technicians can help farmers make better use of the good land and keep it productive. There's more income, more grain and hay per acre than any other time I can remember. The district got our land back on the tax rolls. Schools are better and we have built some new ones. Business is better and the community is more prosperous. It's a better place to live."

You can find a lot of others in Ottawa County—farmers, townspeople, bankers, merchants—who will tell you the same thing.



Wheel-track planting solves two problems at once—soil and water losses and weeds. Tractor wheel tracks make an adequate seedbed for corn, and the area between the rows is left rough—not a very good seedbed for weeds. This means that corn can get the jump on weeds; in fact, weeds between the rows may never become a great problem, or at least can be handled with minimum cultivation.

A finely worked seedbed is highly susceptible to soil and water losses. Heavy rainfall can quickly break down soil particles to a sticky, gummy surface seal that retards water insoak. If water cannot enter the soil freely and easily, it must run off; and when water runs off, it carries soil with it.



With 30 percent more customers since 1940, the American farmer has supplied those customers with about 53 percent more food.



The farmer's share of the consumer's dollar dropped from 40 cents in June 1958 to 38 cents for the same month in 1959.



Christmas tree harvest time in the West Ottawa SCD.

Gold Ridge Farmers Say:

19 Years of Conservation Pays

By Herb Boddy

THE directors and cooperators of the Gold Ridge Soil Conservation District in Sonoma County, Calif., today are enjoying the fruits and benefits of more than 19 years of soil and water conservation work. Good gains have been made in controlling sheet and gully erosion and sand dunes; fruit, dairy, and poultry production has showed a steady gain; and water has become more plentiful because of water development work.

These gains have been accomplished, say district directors, in a friendly and harmonious setting by farmers and ranchers with the zeal and will to put needed soil and water conservation work on the land. The improved prosperity of individual landowners has helped establish a more stable and improved economy for the community as a whole.

Farmers in the Gold Ridge area got their first introduction to planned soil conservation work in 1935 when a Civilian Conservation Corps camp was set up near Sebastopol to provide labor for an erosion control demonstration project.

Until the CCC boys moved in, farmers had had little to do with soil conservation and they had much to learn about erosion and good land management. Soon after the CCC began work on the demonstration project, the farmers organized a Soil Erosion Association to guide the work of the CCC, in much the same way as the SCD boards direct conservation activities today.

In 1941, when the CCC camp was closed down, a work load amount-

ing to two years' work for the 200-man camp was left undone. The farmers' Soil Erosion Association, bent on continuing the erosion control work and carrying out other needed conservation work, organized the Gold Ridge Soil Conservation District, without opposition, in January 1941.

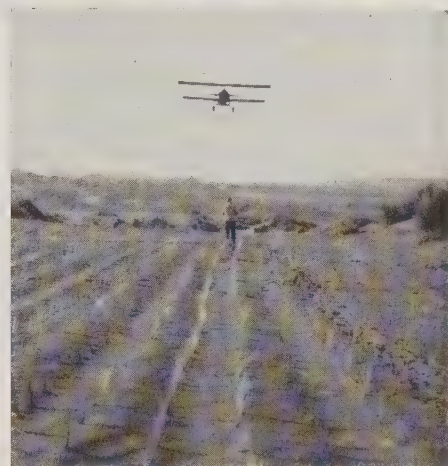
Gold Ridge SCD is in the west-central part of Sonoma County, about 60 miles north of San Francisco, and is bounded on the west by the Pacific Ocean. When the district was voted in, it covered about 99,000 acres; but three additions have increased the size to 134,000 acres and a total of 2,016 farm operating units.

The district's farming enterprises, in order of their importance, include dairying, apple orchards, poultry, berries, sheep, beef, and forest products.

The district's major problems—erosion control, drainage, and water conservation—can be charged to climatic, soil, and topographic conditions. There is no Class I land and every acre needs some kind of conservation work. Most soils are sandy, and the land is rolling to steep. The high rainfall, running from 40 to nearly 100 inches a year, comes between October and May.

Since 1941 nearly 1,800 farmers and ranchers have requested some kind of assistance from the district. About 1,200 farm operators have basic conservation plans for their acreages. The conservation accomplishments have been impressive.

Good cover crops for erosion control and to build up the humus content in the sandy soils are being



Revegetation of sand dunes in Gold Ridge SCD: (above) volunteer community workers planting European beachgrass cuttings near Bodega Bay; (center) airplane fertilizing dunegrass planting, one month after cuttings were set out; (below) a four-year-old beachgrass planting that has been fertilized twice by airplane.

Note:—The author is information specialist, Soil Conservation Service, Berkeley, Calif.



Laying 8-inch drain tile in the Gold Ridge SCD.

grown by many farmers. So far 8,204 acres have been thus treated and 1,000 acres are yet to be treated.

Regular applications of fertilizer on 7,500 acres are being used to grow adequate winter cover crops. Another 1,500 acres need to be treated.

Contour planting of orchards to control erosion are being carried out when full blocks of new orchard are planted.

To control natural drainage running through cultivated land, farmers are either carrying away drainage water underground in storm

drains or constructing sodded waterways. A total of 15 miles of underground drainage lines have been constructed, making this phase of conservation work about two-thirds finished.

In the coastal area of the Gold Ridge district, springs and seepage cause many drainage problems. These problems are being solved by installation of gravel-packed tile drains, 5 miles of which have been laid to date. This job is about one-third completed.

Where water is available or can be developed by dam construction, orchardists are establishing permanent irrigated cover crops. This type of cover not only provides ideal erosion control, but also supplies the supplemental water so badly needed during long dry seasons. This work has been going on only in recent years, but as more water is developed, most of the fruit land will be irrigated.

Livestock ranchers used to grow an annual type of oat and vetch hay which called for preparing a seedbed in the fall, often during the rainy season. When the rains came, hay lands had little or no protection against erosion and soil losses were often severe.

Farmers are now converting from oats-vetch hay to hay composed of perennial grasses or clovers, or are changing hay land to grazing use.

Of the 15,000 acres of eroded hay land in the district, two-thirds have now been converted to permanent cover.

Several thousand acres of once heavily eroded cultivated orchard and hay land in Classes IV, VI, and VII have been converted to crops having year-round cover.

Around 1,500 acres of sand dunes along the ocean side of the district are gradually being brought under control through the joint cooperation of the Gold Ridge district, the California State Division of Parks and Beaches, private landowners, Bodega Bay Grange, Boy Scout troops, and Sonoma County Board of Supervisors. Only 300 acres now remain to be controlled.

These sand dunes were moving into valuable farmland and the community of Bodega Bay, were contributing heavily to drainage problems, and caused heavy silting of Bodega Bay, a pleasure resort and the home base for large fishing fleets.

In this area of seasonal rainfall where water conservation is so important for stockwater and irrigation, ranchers have built 101 stock ponds and irrigation reservoirs. New reservoirs are being built at the rate of about 10 a year.

The Gold Ridge SCD employs an equipment manager to service, route, and handle the many pieces of small equipment owned by the district. Many small ranches require such equipment as fertilizer spreaders and seeders, and the district fills this need.

This district has an active educational program, both in the schools and for the general public. District directors sponsor a conservation essay contest each year for Analy High School biology classes. Window displays in the district office in Sebastopol are changed weekly. Timely and helpful press stories are released. Materials are purchased and provided district clergymen for their use during Soil Stewardship Week. District offi-



Contour planting of holly trees in Gold Ridge SCD.

cials and SCS staff members participate on programs of civic and farm groups.

The Gold Ridge district also is a sponsor of the \$11,730,000 Central Sonoma watershed project and the Laguna watershed project, both of which fall largely within the district's boundaries.

After 19 years of operation the Gold Ridge remains a very active district. Thirty to forty basic conservation plans are prepared each year. The district directors are interested in their job, both locally and from a Statewide viewpoint. They are very proud of the dune control project at Bodega Bay, proceeding under district leadership.

Ezra Briggs, who has been on the board as its chairman since the district was organized in 1941, made the following comments about the district program:

"We used to have whole fields that were full of gullies, coming down into the draws. That was taking plenty of topsoil, many tons of it, every good rain. When we put this land in permanent pasture our soil losses stopped. There is no erosion in these fields now. This is due entirely to soil conservation district activities and the practices we encouraged farmers to use.

"We are producing 100 pounds



Stockwater pond in Gold Ridge SCD.

a head more butterfat from our cows than in the days before the district. Production of dairy products has increased a third or more since the district was formed, and, in addition, ten to fifteen thousand head of sheep are now being raised on the same land we formerly used only for grazing dairy cattle.

"For the past five years or more we have done a lot of work on the sand dunes along the ocean beaches. Planting of grasses has prevented sand blows which filled up Bodega Bay. The bay had to be dredged twice before we started our plantings. Last year we put in 2,400,000

plants (dunegrass cuttings).

"Before we had the district and the help of the SCS technicians, we used to sit around and talk about the problems we were having, but we did not know what to do to correct them. We needed someone to help us organize and give us advice. Without the technical assistance, it probably would never have gotten done.

"We do not say that in Gold Ridge we have gone all the way. We maybe have half of the job done so far. But as we go, we learn more and better ways of doing things."

Two-Way Radio Speeds Conservation Work

By Herbert I. Jones

THE Stephens County Soil Conservation District in Oklahoma claims to be the first district in the Nation to use two-way radio to speed service to its farm and ranch cooperators. The equipment was provided by the district supervisors early in 1960, in an effort to speed up grass seeding, grass seed harvesting, and other conservation operations. Bill Pitman, the district field manager, says that the 20-

percent increase in grass seeding last spring may be credited largely to more efficient operations resulting from the radio setup.

At present, only 4 sets of receivers and transmitters are operated from station KKY-792. The central set is in the district office in the county seat at Duncan. One set is in Pitman's pickup, another in the truck used by district-employed helpers of Pitman, and the fourth set in the car used by Bob R. Brown, the SCS work unit con-



Outlet of a 15-inch underground storm drain in an orchard in the Gold Ridge SCD.

Note:—The author is information specialist, Soil Conservation Service, Denver, Colo.



Bob R. Brown, SCS conservationist (left), and Nolen J. Fuqua, chairman of Stephens County SCD board of supervisors, use 2-way radio to route district employees in grass seeding work.

servationist. Signals go out and are received from a high-gain antenna sealed inside a 15-foot plexiglas tube mounted on a 75-foot pole at the district warehouse. The practical limits of transmission and reception are about 30 miles.

SCS conservationist Brown is credited with selling the district supervisors on the idea of 2-way radio. Brown claims he got the idea originally from his teenage son, Bob, and young Bob says he got the idea from watching the operation of a radio-equipped motor fleet of a local oil company.

The Stephens district effort that makes two-way radio practical centers on a massive campaign to convert low-class cropland to pasture. Yearly progress toward this goal has reached a peak of 13,000 acres of grass seeding a year.

Pitman keeps a full line of grass drills, spreaders, and spriggers running from one end of the district to the other helping cooperators get the results they plan with Brown and the other SCS technicians. At times he has 20 drills in action.

The supervisors feel that the dis-

trict should provide such equipment mainly because it helps the district speed up the conservation job. Often, after a new type of drill is purchased and tried by the district, it is sold to a farmer or rancher to help him get his work done faster. Since he usually shares

the machine with neighbors, he speeds up their seeding, too, and awakens new interest in the district program.

The supervisors think the new radio will help in seed harvesting when that season rolls around just as it did during the drilling season. Combining, cleaning, and selling seed is part of the district's service. Most of this job is handled by custom operators.

In one year recently, manager Pitman supervised the harvesting of 175,000 pounds of native bluestem, King Ranch bluestem, and lovegrass seed. Last spring he saw nearly half that amount planted in the range reseeding program of the district. The rest of the harvested seed went to nearby districts.

Between harvest and drilling, there's the warehouse to run. It, too, is operated as a service to the farmers and ranchers. New seed is carefully cured, dried, and cleaned to insure top germination.

The district is a certified vendor by Agricultural Stabilization and Conservation Committee standards, and it works closely with the Agricultural Conservation Program.



Aerial view of conservation practices in Stephens County SCD.



Bill Pitman receives instructions from the district office over the 2-way radio.

One county committeeman recently praised the district's operation for efficiency and for the help it provides the county's producers. He and the other committeemen attend district planning sessions and work closely with the district.

In addition to the extensive re-vegetation work, many other types

of farm and ranch conservation practices are included in the district work program. Also, the Stephens district sponsors the Wildhorse Creek watershed project. This is one of the first known creek-size watersheds in the Nation to include city water development in a project carried out with Federal assistance.

Farmers and ranchers of the county keep the district office phone fairly busy in their requests for service. Many of these calls are relayed to Brown, Pitman, or the other district employees by the radio. This saves many miles of travel for the district and SCS men.

Two-way radio seems a natural under the circumstances. The transistor radio installation cost about \$3,500. The county civil defense group paid about half of this with the understanding that the district operators and equipment would be volunteered for emergency work



Caucasian bluestem, 1 year after planting, on the Ralph Emory ranch near Duncan, Okla.

involving the defense unit.

The equipment is proving so satisfactory that there is talk of five additional sets. One or two of these will go in the supervisors' personal cars. Then they can keep tuned in all day on what supervisor Clyde Stanton calls "our favorite radio program."

All of Smith County prospers when

Farmers Go to Grass

By Leon J. Sisk

From corn to grass . . .
From plow to cow . . .
From pitchfork to haybaler . . .
From backyard washpot to electric washer . . .

From drab, gullied landscape to beautiful countryside . . .

These are just a few of the more visible evidences of what its soil conservation district means to Smith County, Tennessee.

R. L. (Bob) Dudney went to Carthage in 1945, as Soil Conservation Service work unit conservationist, to assist farmers in the newly organized Smith County Soil



Except for 2.6 acres of tobacco and a small vegetable garden, every acre of this 400-acre farm is in grass. "Not much water comes off those hills," says owner J. W. Cowan, "and what does is clear enough to drink."

Note:—The author is information specialist, Soil Conservation Service, Spartanburg, S. C.



M. J. McKinney (left) and W. C. Bridwell, Jr., of the Citizens Bank, display a sign given to Mr. McKinney for being an outstanding cooperator of the Smith County SCD in 1959.

Conservation District. He took one look at the land and told them to go to grass. Some landowners and operators merely smiled at first. Many asked questions or had to see their neighbors try it. But hundreds eventually took his advice. Today, 1,453 farmers have signed agreements with the local district supervisors and developed conservation farm plans with Dudney's technical help.

The benefits of modern conservation farming have not been confined to the land and rural people. In the lively little county seat town of Carthage, citizens are prosperous. Business is good, says everyone who is asked. And the business is built entirely on an agrarian economy. There are few industries in Carthage. Even tourist business bypasses the town on U.S. Highway 70-N, a quarter of a mile away.

Smith County has been under the plow a long time. An historical marker at the Tillman Dixon home reads, "Tillman Dixon made the first settlement here in 1787." Almost two centuries of cultivation is bound to leave its mark, especially on the shallow but highly fertile soils that predominate in Smith County. Because of the rolling terrain, the land must be farmed carefully or it will erode severely.

Corn and tobacco were the main crops until recent years. "When I came to the Smith County Soil Conservation District," Dudney says, "you could drive up on a bluff overlooking the Horse Shoe Bend of the Cumberland River and all you could see was corn."

Today all you see from that point is grass.

"At that time," continued Dudney, "I know one farmer whose corn made 8 bushels an acre. It brought \$1.25 a bushel or a gross of \$10 an acre. Now you'll hardly find a field of corn in the district that will not produce 50 to 100 bushels an acre. It is a matter of record that Smith County averages 11 bushels more than any nearby county."

The reason? "Land selectivity"—using the land for what it is best suited to grow, based on land capability. That means corn on the more level land and grass on the steeper land.

For example, Hooper Burton, a district cooperator, used to grow 44 acres of corn that averaged 25 to 30 bushels an acre. Now he has only 14 acres of corn on flat level land that will make 80 to 100 bushels an acre. Fourteen acres now produce more than 44 acres formerly did. As a result, Burton now has about 30 beef cattle and 40 hogs. The only feed he ever buys is some protein supplement and occasionally a little grain.

Burton's sloping land is in grass and protected by diversion ditches. That keeps the bottomland from flooding so he can grow corn there.

Such combinations of vegetative and mechanical control are characteristic of the program in the district. A list of practices used in the district includes stubble mulch farming, turning sod for row crop production, improved water disposal systems including terraces and waterways, critical area treatment, roadside erosion control planting, wildlife planting, and others. Grass, however, remains the one conservation practice most widely used. And the grass is not native grass, but Kentucky 31 fescue and Ladino clover.

Today, farms are prosperous looking, with well-cultivated fields, good crops, weed-free pastures, neat and attractive homes (many new



Multiflora rose fences separate the 300 acres of grass from the row crops on the Ed Hackett farm in Smith County.



Dairy cattle on fescue-and-clover pasture on the Delmas Gregory farm in Smith County. Gregory says: "If I was still row-cropping I'd be broke."

and many of brick), and new, modern farm equipment.

"At least 98 percent of the homes in the county have electricity," said Carl E. Kirby, manager of the Upper Cumberland Electric Membership Corporation. "But if it hadn't been for the district program, not nearly as many homes would have electricity, to say nothing of appliances. People also are installing telephones at a fast rate, and about 40 percent have put in water. Many homes are completely equipped with electric appliances."

R. L. Upchurch, hardware store owner, corroborated what Kirby said about appliance sales. He said his business, 90 percent of which is with rural people, has tripled in 13 years.

As further evidence of the value of soil and water conservation to the community, Upchurch pointed to a block of buildings including his store, all of them relatively new, on the west side of the square in Carthage. The seven stores are doing nearly a million dollars worth of business a year, Upchurch estimated. And 90 percent of it is farm business.

As hogs went out with corn, and cows came in with grass, need for a milk market developed. In 1945 a national company established a

cheese plant which later became a feeder station for a nearby evaporated milk plant. Daily purchases of 30,000 pounds of milk increased to 100,000 pounds. Now other companies also buy milk in Smith County and total production is several times greater than that.

Farm equipment dealers report increased sales in the past decade and a continuing good business. Part of this has been the normal replacement of horses and mules with tractors. But it also includes milking machines, rakes, mowers,

hay conveyors, and other equipment. Where 15 years ago there were few hay balers, one dealer now estimates between 200 and 300 in the soil conservation district. A local dealer sells 1,000 balls of baler twine a year, enough to tie 500,000 bales of hay.

Fertilizer dealers also are happy. A large dealer reported current sales of 850 tons a month; in 1946 monthly sales averaged 200 tons. Six petroleum products distributors report greatly increased business because of the mechanization of farms and greater prosperity. And so the story goes, both on Main Street and out in the country.

Figuring that money talks, I asked the two banks in Carthage what soil and water conservation had meant to the community. Both the Citizens Bank and the Smith County Bank reported an amazing increase in assets the past 15 years—despite little change in Carthage's population of about 2,000.

Walter G. Bridwell of the Citizens' Bank showed me the profit and loss statements for 1946 and 1958. In 1946, the bank's resources and assets were \$3,472,000. In 1958 they totaled \$6,332,362.

"We are proud of this achievement," Bridwell said, "and proud



It takes water as well as grass to produce milk, so ponds are much in evidence in Smith County.

of our farmers who have made it possible. Although business in general has improved, farm income has not kept pace nationally. In Smith County our assets have almost doubled because of improved farm income. That wouldn't have happened without the widespread swing to grass and other benefits of conservation farming."

Cashier Russell Pitchford of the Smith County Bank said that "what benefits farmers benefits all of us and the district program certainly benefits farmers." The Smith County Bank sponsors a pasture program each year and awards sterling silver loving cups to four winners each year.

So grass, next to soil and water themselves, has become one of the most important assets of Smith County. When the soil conservation district was first started, farmers would come into the office and talk about "seeding pastures." Now they talk about "sowing grass." Grass has become a crop.

The chemical 2,4-DB will eliminate most broadleaf weeds in growing alfalfa without injury to the crop, Oklahoma Experiment Station trials show. E.P.T.C. has also been effective as a grass and weed eradicator in alfalfa when applied as a pre-emergence spray immediately after planting the crop or when incorporated in the soil before seeding.

Fertilizer trials at Kansas State University comparing anhydrous ammonia and ammonium nitrate have shown that where equal amounts of nitrogen are used, yield results are essentially the same.

The Soil Conservation Society of America will hold its 15th annual meeting August 28-31 at Ontario Agricultural College, Guelph, Ontario, Canada. Theme of the 1960 meeting is "New Technologies in Land Resource Management."

A Book Designer Turns Conservationist

By Lester Fox

ROBERT JOSEPHY was a book designer. His work kept him in the big cities: New York, Boston, Hartford. He had a yearning, though, to live in the country—to be a tiller of the soil.

So in 1934 he bought a farm near Bethel, Conn. Though he knew little about farming, he thought he would like it. He had general farming in mind. Soon, however, he decided that both the land and his own interests were best suited to growing fruit.

The land held little prospect. It was eroded and run down. Today, though, Josephy has a thriving fruit business. Of his 150-acre Blue Jay Orchards he has 60 acres in apple trees 4 to 25 years old. The 45 acres in production yielded 25,000 bushels last year—555 bushels an acre.

Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.



Robert Josephy gives directions to his stepson, Michael McCleery, as the latter harvests apples.

Josephy sells 80 percent of his apples through a fruit growers association which serves a 120-store grocery chain. He retails 20 percent of his crop at a roadside stand next to his orchard home. By design, the stand is part of his cooling, sorting, and packing building. He found that customers like to see the various operations. With everything under one roof, they find the whole layout conveniently arranged.

To make full use of all the apple crop, Josephy added a cider press to his roadside layout. Now customers can see how cider is made.

Josephy grows peaches and pears for his retail trade. They add to the color and variety of his wayside market. Farm-fresh eggs also bring customers; so he put in a flock of 500 chickens. He uses the manure in the orchard. Soon, Christmas trees now being grown will be sold at the roadside stand.

Josephy continued to work as a book designer after buying the farmland. But he gradually "tapered off," as he puts it, to give more time to his orchard. Six years ago he withdrew altogether from book designing to give full time to farming. He runs the whole operation with only three year-round workers in the orchard and one at the stand. During the peak season he employs as many as 30 workers—pickers, sorters, packers, etc.

Josephy learned quickly about farming. He keeps up with the work done at Beltsville, Md., and

other agricultural research centers. From the start he has consulted professional agricultural workers.

After doing a lot of cleanup work—removing brush, worthless trees and surface rocks—Josephy planted seven acres to apples in 1935. He planted five more acres in 1936 and six in 1941. Then he was through until after the war. “Then things moved along faster,” Josephy said. “We planted a new block every year.”

In 1947 Josephy became a co-operator with the Fairfield County Soil Conservation District. Today he is on the five-man board that runs the district. As a district co-operator he receives help from the Soil Conservation Service on technical conservation problems.

As part of his conservation program, Josephy keeps his orchard under permanent sod. He cuts hay from 35 acres of meadow every year. He mulches the hay in a ring under the tree drip.

“I don’t mulch around the trunk as there are not many feeder roots close to the tree,” Josephy said. “So the mulch wouldn’t do any good there. Besides, mulch around the trunk encourages mice and they can do a lot of tree damage.

“We have been able to reduce the amount of nitrogen fed directly to the trees by applying the nitrogen to the hay used as a mulch. A month or two before we cut the hay, we give the crop 100 pounds of actual nitrogen per acre. That increases the tonnage. But what’s more important, it supplies more nitrogen to the trees when the hay is spread out as a mulch. The mulch releases the nitrogen slower and there’s no loss from leaching.”

Josephy mows the orchard sod twice a year. In the older orchards he lets the clippings stay on the ground where they fall. In the young orchards he side-rakes the

clippings up to the trees.

Another conservation measure was the removal of a mile of stone walls that divided the farm into small fields.

“In one 15-acre orchard that was composed of four square fields, we gained an acre by removing the stone walls,” Josephy said. “But more important was the time we gained in working the orchard as one piece.”

The property has 2,500 feet of tile drains and 1,500 feet of open drainage ditches.

Josephy has built four ponds. Two big ones were built to supply irrigation water. Two small ones supply spray water.

Summing up his operations, Josephy said: “There isn’t any question that a rounded conservation program increases yield and improves fruit quality. I know from observation, for example, that comparable orchards without sod have a much lower yield. And that’s just one conservation practice.

“But these are not the only benefits, nor the most important ones. The greatest gain is the increase in efficiency that you get with a good conservation plan. You can get more things done quicker with less help. That’s why I can manage the whole orchard myself

with only three full-time men. A balanced conservation program lets you get as close to streamlined production as you can get in the farming business. Aside from conserving soil and water, that’s its biggest and most important value.”

International Meeting of Soil Scientists

The Seventh Congress of the International Society of Soil Science will be held at the University of Wisconsin in Madison, August 15-24, 1960. The Soil Science Society of America is the sponsor, with the Soils Department of the University of Wisconsin acting as co-host. Professor E. Truog of the university’s soils department is in charge of registrations and reservations.

This will be the second time that the International Society has met in the United States; the other time was the meeting of the First Congress at Washington, D. C., in 1927.

Between 1,500 and 2,000 soil scientists and other interested individuals are expected to attend the Congress in Madison. Besides the large delegations from the United States and Canada, about 400 individuals from more than 60 different countries on other continents are expected to attend.

In addition to the many scientific papers presented and the discussions held during the 10 days the Congress is in session, 3 extensive tours have been arranged. The first tour, preceding the Congress, will travel through several northeastern and midwestern States between New York and Madison. The other tours, primarily for visiting scientists from other countries, will follow the adjournment of the Congress; one will be from Madison to Washington, D. C., through midwestern and southeastern States, while the other will be from Madison to Berkeley, Calif., via Iowa, Nebraska, Colorado, New Mexico, and Arizona. All tours will be by bus and will include stops for demonstrations of American research and to study soil conservation work on farms and ranches.



Mrs. Sandy Melycher (center) takes care of customers at Josephy's roadside stand.

OFFICIAL BUSINESS

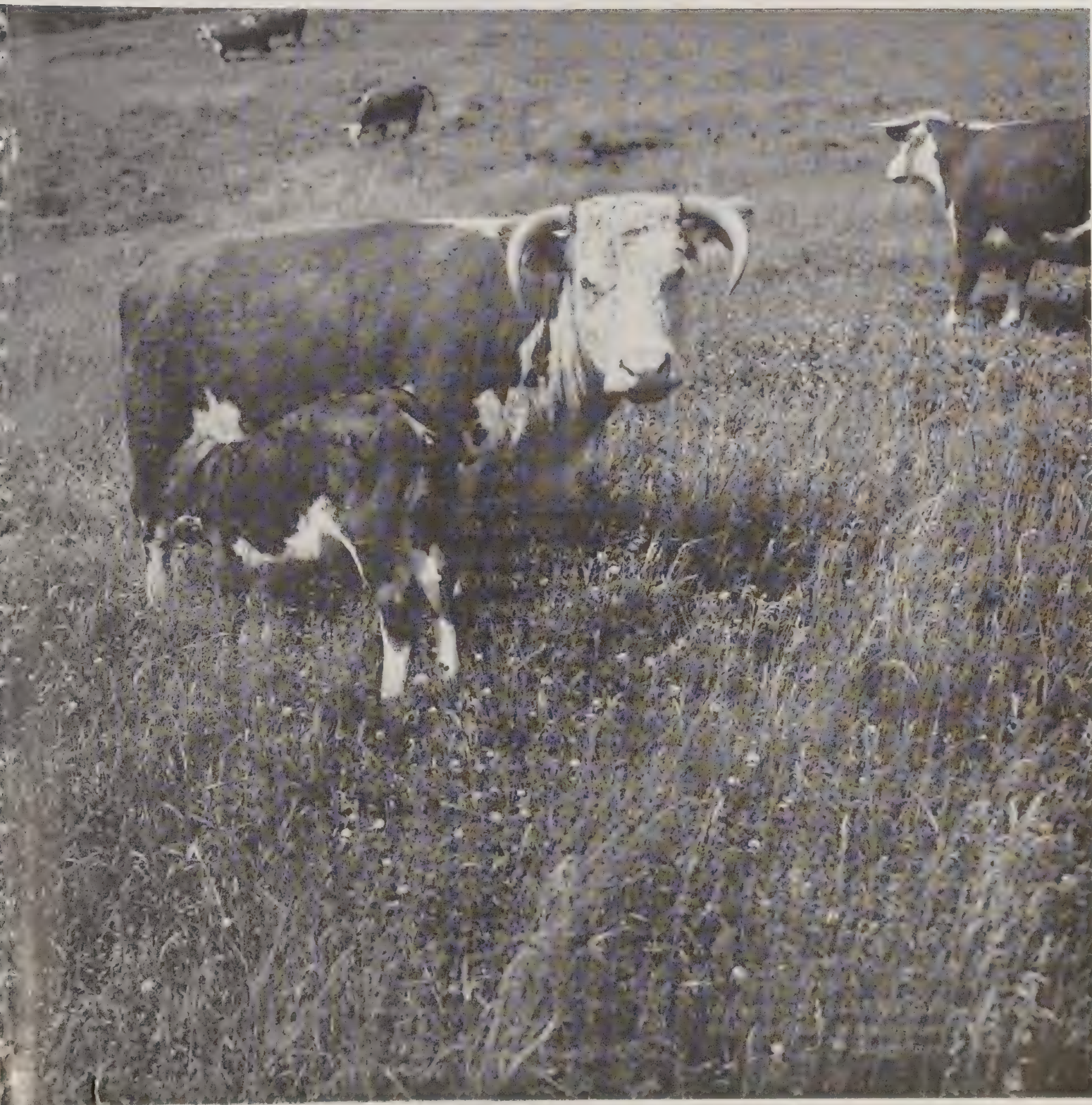
CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER



Mr. and Mrs. Seiichi Fujita receive Outstanding Conservation Farmer of the Year award for the Olinda-Kula SCD from Elmer Cravalho, chairman of the board of directors, at a dinner held in the Vineyard Chop Suey Restaurant, Maui Island, Hawaii.

SEPTEMBER 1960

Soil Conservation



CONTENTS

PAGE

- 27 Hay production Increased 7-fold, Cattle 10-fold
By Tom Turner
- 29 More Stock Watering Places
By Mark E. Hill
- 31 Erosion on Piedmont Soils
By A. P. Barnett and B. H. Hendrickson
- 34 Browntopmillet for Wildlife
By Morris Byrd and W. C. Young
- 36 Mulch Planting of Soybeans
By T. H. Hilliard
- 38 Mulching Flood Prevention Structures
By William L. Smith
- 40 How to Install a Pipe Overfall
By Larkin B. Agnew
- 42 Grass Better Than Wheat
By Walter N. Parmeter
- 43 Better Woodland Through Water Control
By Edwin C. Wilbur
- 44 John M. Bryant of California—A Profile
By Alex Gay
- 46 Early Streambank Stabilization
By Paul Tabor
- 46 Book Reviews

"What now remains of the once rich land (of Attica) is like the skeleton of a sick man, all the fat and soft earth having wasted away, only the bare framework is left."

—PLATO
380 B. C.



COVER PICTURE.—Orchardgrass and Ladino clover pasture in Northumberland County, Pennsylvania.

Soil Conservation

EZRA TAFT BENSON
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

TOM DALE, Editor

15 CENTS PER COPY

\$1.50 PER YEAR

FOREIGN—\$2.25 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents,
Government Printing Office, Washington 25, D. C.

Hay Production Increased 7-fold, Cattle 10-fold

By Tom Turner

REPLACEMENT of native meadow grasses with alfalfa and improved grasses and more efficient water use are enabling John Rutman to produce seven times as much hay on his Devil's Gate Ranch near Elko, Nevada.

When Rutman purchased the ranch in 1949, he cut 450 tons of meadow hay from 1,000 acres. Now he averages 3,000 tons from 800 acres. In 1949, the ranch was supporting 260 head of cattle, but now Rutman runs between 2,000 and 3,000 head.

Rutman recalls that after he had had his better hay production program underway for a couple of years a native old-time cowman neighbor stopped by the ranch. "John, I sure hate to see you plow up those meadows," the neighbor commented. "Elko County was built on them, and its a mistake to bust them out. You're just pouring your money down the drain," the old cowman argued.

The neighboring rancher visited the Rutman ranch again in recent years, and observed the numerous huge stacks of baled hay. "John, I'll have to admit you were right about breaking out the native meadows for alfalfa and new grasses," he commented. "Those big stacks of hay sure are a pretty sight."

Rutman's ranch includes 16,600 acres of deeded land, and grazing rights on an additional 100,000

acres of public land. His privately owned land includes a strip about a mile wide and more than 20 miles long.

After cutting his first meadow hay crop in 1949, and getting only 450 tons from 1,000 acres, Rutman decided that he needed to change to higher producing crops, and to make better use of water so he could produce more feed for more livestock.

"Where I came from cattle didn't like sagebrush, and I didn't think they liked it here," Rutman says. "I believed that my 3,000 acres of bottomland, coupled with a good source of water, would produce the feed I wanted, but I needed technical assistance," he recalls.

Rutman became a cooperator of the Starr Valley Soil Conservation District, and SCS technicians assisting the district made soil survey and topographic maps for him. Then they helped him develop a conservation plan for the entire ranch.

"SCS engineer Hugh Rossolo and soil scientist Don Bagley of Elko were particularly helpful in getting me started off right on a complete soil and water conservation program," Rutman says.

In order to increase his water supply, Rutman drilled a 350-foot well in 1951. The well, which has a 16-inch casing, pumps around 2,000 gallons a minute. During the spring the well flows from artesian pressure, but most of the time the



John Rutman (center) and cowboys vaccinate one of the Rutman calves.

Note:—The author is work unit conservationist, Soil Conservation Service, Wells, Nev.

water stands around 25 feet from the surface.

Rutman further increased his water supply in 1955 when he dug a sump 250 by 350 feet in area, which is filled by ground water. The sump yields around 1,000 gallons a minute, so the combined yield of the well and sump is between 6 and 7 cubic feet per second. Rutman is now installing 1,260 feet of 8-inch pipe from the well to a

high line ditch about 12 feet higher than the well surface. This will enable him to irrigate the higher areas of the meadows.

The irrigation system on the Devil's Gate Ranch includes about 45 miles of canals, and numerous water control structures. Around 800 acres have been leveled for more efficient irrigation, from 50 to 100 acres being leveled each fall. Between 400 and 500 acres remain

to be leveled. Border ridges are used to obtain better efficiency in water use.

Most of the conservation work on the ranch has been done by the employees with SCS providing the necessary technical assistance. Last fall, for the first time, 70 acres of land leveling was contracted at a cost of 14 cents a yard of earth moved. Rutman feels that at this price he cannot afford to do the work himself. The average cost of the land leveling had been \$65 an acre.

Rutman believes in using his raw product, hay, to produce finished beef. He supplements the hay with barley and other grains in pellet form. He operates a feedlot to finish out both heifers and steers. The cattle go into the feedlot after weaning early in December at an average weight of 375 pounds.

The lighter 60 to 70 percent of the calves are turned in the open range around April 15. The remaining 30 to 40 percent are finished to weigh about 1,000 pounds when sold in October. The lightweight yearling steers and heifers are gathered from the range late in July, and are put in the feedlot and finished. These are sold in late winter weighing about 1,000 pounds.

The average rainfall in the area is 8 to 9 inches, but was only 4 to 5 inches during the drought year of 1959. That year only a fourth of the 800 acres in alfalfa received more than one good irrigation. Hay production was about 2,000 tons, considerably below the 3,000-ton average, as a result of the drought.

Rutman usually irrigates and cuts 1,500 to 2,000 acres of native meadow hay in normal rainfall years, but last year only 500 acres were cut with a yield of 250 tons. "If I hadn't had alfalfa and tame grasses, I wouldn't have produced much hay last year," he says.



A self-propelled windrower (above) cuts and windrows alfalfa hay on the Devil's Gate Ranch, then a field chopper (below) chops the cured hay before it is hauled to the feed lots.



Many ranchers in the area had to reduce their herds and buy hay as a result of the drought. Grazing on the public range was especially poor. A lot of cattle put on the range last spring came off in the fall with less weight. Rutman sold around 700 weaners, yearlings, and cows because of the condition of the public range.

"The soil and water conservation program is the greatest thing that has come to farmers and ranchers in this country," declares John Rutman. "The trouble is that too many are sticking to the methods used by their forefathers instead of adopting modern practices."



Land leveling operations on the Rutman ranch.

More Stock Watering Places

By Mark E. Hill

LIVESTOCK now find it easier to get a drink of water on the ranges of the North Bingham Soil Conservation District, simply because there are more watering places.

Sid Balmforth, the district "Cat skinner," spent a good part of last summer in the hills developing water supplies, using the district carryall and bulldozer. He took the equipment to the hills to build three stock ponds. Before he got back he built 8 new ponds and rebuilt 10 more that had washed out or were so filled with silt they were useless. He also assisted with two spring developments.

Jack Klossner helped out by bringing in a back-hoe and developing springs for George Hansen and the Eastern Idaho Grazing Association.

Each new pond was surveyed

and designed by Soil Conservation Service technicians to hold enough water to provide for the needs of the cattle which would graze in the area.

Balmforth built the ponds to specifications, with a minimum top dam width of 8 feet and a 2 to 1 slope on the downside and 3 to 1 slope on the water side. An ade-



Sid Balmforth with his pond-building equipment in the North Bingham SCD.

Note:—The author is work unit conservationist, Soil Conservation Service, Shelley, Idaho.

quate spillway was installed to protect the dam from washing out and to establish a minimum depth of 6 feet. Lack of spillways was the cause of failure of the dams that needed rebuilding.

Balmforth's first step was to bulldoze off all the overburden, consisting of topsoil and organic materials, to below the dam site area. After the dam was completed, Balmforth pushed this overburden up against the fill on the downside.

A clay core was built across the channel and packed with the carry-all. The clay core is necessary to hold the water. Sites were always selected where clay was available.

The clay core and an adequate spillway are the key to success with stock ponds.

"Sid sure knows how to build those ponds," E. C. Geisler said as he told me of his plans to have Balmforth build three more for him next year. Many ranchers have made similar remarks as they saw the newly built or reconstructed dams while making round-ups in the area.

Cost per pond ranged from \$260

to \$325 with ACP sharing about one half of the cost of the 8 new ponds.

Springs were developed by George Hansen and by the Eastern Idaho Grazing Association. Springs have an advantage over ponds in that the water stays clear and clean—even suitable for man to drink. But they often are more expensive. One of the Eastern Idaho Grazing Association spring developments cost about \$1,400.

These springs were developed by digging a trench about 5 feet deep through a bog area. Tile or concrete pipe was laid to collect the water. Clean gravel was packed around and on top of the tile. A clay core was laid across the drainage way to force all the water into the tile. A 2-inch steel or plastic pipe was connected to the tile, with or without a stilling box. The pipe runs downhill, underground, until an elevation is reached where the pipe can be brought up to empty into a trough by gravity flow.

The whole spring area is covered with rock or fenced with a sturdy pole fence.

"We've needed these water developments for a long time," said George Hansen, a director of the Grazing Association. "We spent a lot on fencing and water this year. But we're not worried. It'll soon pay off."



As of January 1, 1960, cattle numbers in the United States reached a new high of 101.5 million head, an increase of about 5 percent during the year. The increase was in beef cattle, since the number of milk cows declined by 1 percent, to a 43-year low of 21.3 million.

National Grasslands

About 3.8 million acres of public lands were recently designated as "National Grasslands" by the Department of Agriculture. Most of the newly named National Grasslands are in the Great Plains States of North Dakota, South Dakota, Wyoming, Nebraska, Kansas, Oklahoma, Texas, and New Mexico, with smaller acreages in Idaho and Oregon.

These National Grasslands were originally purchased in the 1930's by the Department of Agriculture as a part of the Land Utilization program authorized by the Bankhead-Jones Act. At the time of Federal purchase most of the land had been severely damaged by wind erosion, and the Government purchase was done mainly to check the wind erosion and restore permanent grass cover. The lands were managed and developed by the Soil Conservation Service from 1938 through 1953, at which time they were turned over to the Forest Service for administration.

The Forest Service will continue to manage the National Grasslands in accordance with its multiple-use program, in much the same way it manages National Forests.



Jack Klossner (right) and assistant locate an adequate water supply for spring development on Eastern Idaho Grazing Association land.

EROSION ON PIEDMONT SOILS

By A. P. Barnett and B. H. Hendrickson

THE Southern Piedmont is part of a very ancient land formation extending across northern Alabama, Georgia, and South Carolina and continuing northeastward in a narrower belt into Virginia. The Southern Piedmont originally was a tilted plateau about 150 miles wide, sloping southeastward from the base of the Blue Ridge mountains at elevations of about 1,200 feet, to an elevation of 600 feet at its lower edge, where it dropped abruptly to the 500-foot elevation and joined the upper Coastal Plain.

The Southern Piedmont no longer resembles a plateau. It now is hilly country, deeply dissected by numerous stream valleys with only a few broad ridges of gently sloping land. The soils have developed from weathered granitic rocks. Soils of the Cecil series occupy about 22,000,000 acres, or approximately two-thirds of the area.

On uneroded uplands, the Cecil sandy loam topsoil is about 8 inches deep and is underlain to depths of about 5 feet by red clay subsoil. Below the subsoil to depths of 25 feet or more, porous rotten rock rests on bedrock. Originally the surface soil was grayish-brown in color. Today, most of the soil in cultivated fields is red or reddish, the color of the plowed-up subsoil. The soils of the Cecil series are not naturally very fertile, but they are responsive to good fertilization and management, if not too badly eroded and gullied.

About one-third of the area is forested; the remainder is open

land, including cropland, pasture, and idle land. According to soil surveys, 75 percent or more of the uplands have suffered moderate to severe erosion. The most extensive land class is the moderately eroded, moderately sloping Class IIIe land.

Until about 25 years ago, mule farming predominated in this area and produced cotton, corn, oats, and cowpeas. There were few livestock other than mules, and few improved pastures. Tenants and sharecroppers operated 60 percent of the farms.

Rapid changes in agriculture have occurred in the Southern Piedmont during the last two decades. There has been an almost phenomenal increase in the number of livestock on farms, numbers of tractors, and pasture-development work; and substantial increases in the production levels of improved farm crops and products. The percentage of owner-operators has in-

No. 57

This is the fifty-seventh of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

creased sharply as well as the acreage per farm operator. During this period there has been a steady increase in the establishment of conservation farming methods.

The climate is favorable for diversified agriculture—adequate rainfall, a long growing season, and mild winters. The growing season averages seven months between frost dates. Cool-season pasture crops grow two-fifths of the time during winters.

During the past 20 years, research at the Southern Piedmont Soil Conservation Field Station,



Test plots on Class IIIe land at the Watkinsville Soil Conservation Field Station.

Note:—The authors are, respectively, agricultural engineer and soil conservationist, Agricultural Research Service, Watkinsville, Ga.

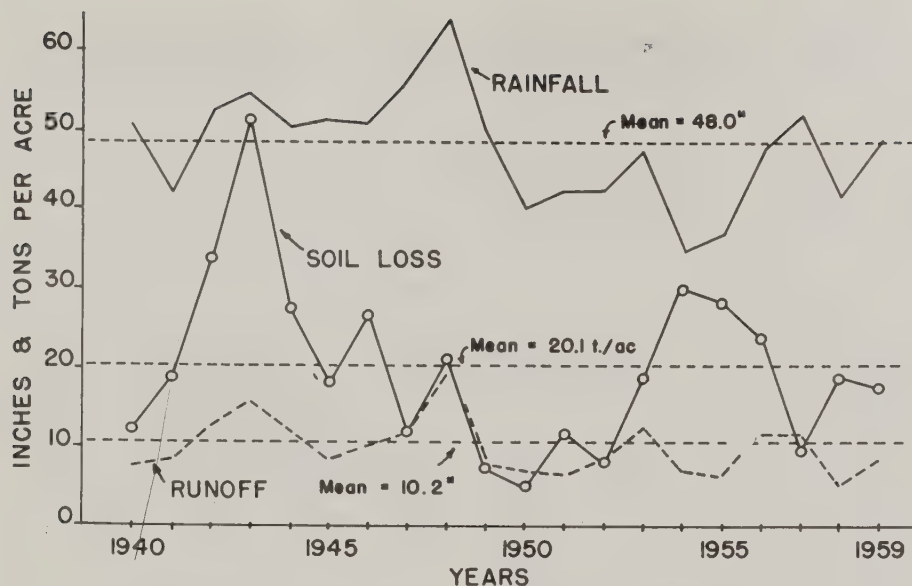


Fig. 1. Annual rainfall, soil loss, and runoff; Class IIIe land, continuous cotton.

Watkinsville, Georgia, has been directed toward the development and testing of practical methods to reduce soil and water losses and restore productivity of the farmlands of the Piedmont. Useful and meaningful data have come from a series of runoff plots on the Cecil soils of 7-percent slope. They represent conditions existing within a 5- to 9-percent slope range, and are typical of the land on which most Piedmont farmers make their living.

The key data on soil and water loss which were used for check purposes came from continuous cotton plots operated for 20 years on Cecil soils, Class IIIe land. Data from these and companion plots form the basis for the following discussion.

The year-to-year erosion hazard—the severity of erosion in different years—has been determined from runoff and soil loss data from continuous cotton plots since 1940. The year-to-year variation in soil loss is shown in Figure 1. The maximum annual loss of 53 tons per acre was measured in 1943, while the minimum annual amount, 5 tons per acre, was measured in 1950.

It is of interest to note that during the years when erosion was

above the average of 20 tons per acre per year, there was keen public interest in terracing and water disposal systems. In periods like the middle 1940's and early 1950's when erosion was below average, the interest in terraces was slight, and, in fact, many terracing systems on farms were abandoned. An increased interest in parallel ter-

aces during the past 5 years coincides with an upward trend in soil loss.

What causes the year-to-year variations in erosion? Figure 1 shows that there is no close relationship between amounts of rainfall and erosion, nor between amounts of runoff and erosion. Therefore, to explain the annual variation in erosion, we must look for something other than volume of rainfall or runoff.

Let us examine Figure 2 that shows the seasonal distribution of rainfall, runoff, soil loss, and excessive-rate storms. Both rainfall and runoff have a similar seasonal distribution pattern; but the erosion pattern differs widely—though the erosion and excessive storm pattern are quite similar. This shows that erosion and the frequency of excessive-rate rainfall are closely related.

What is an excessive-rate storm? It can best be described as a “thunderstorm”—the type usually associated with the warmer months, although they can occur any time of the year. A half-inch or more of

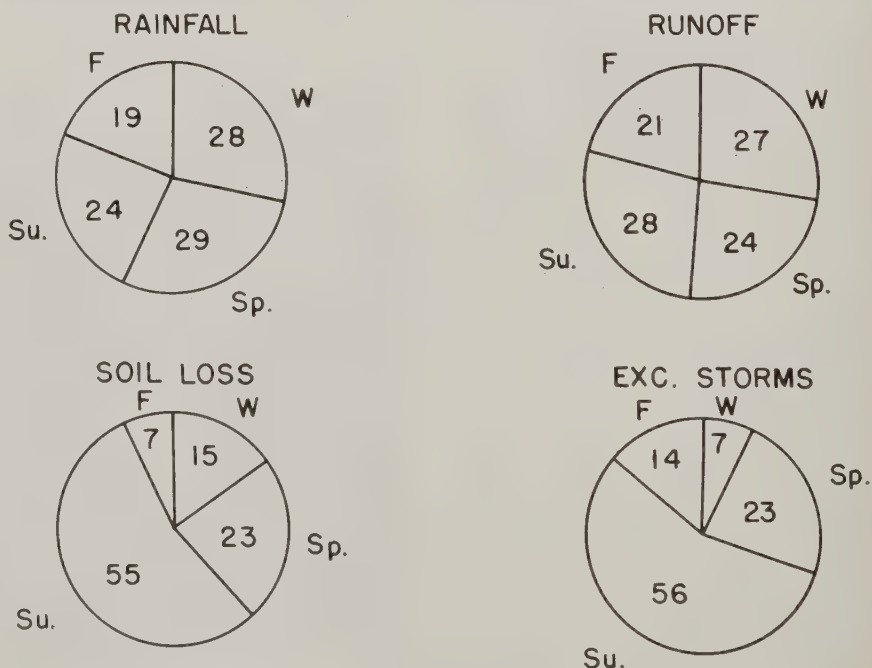


Fig. 2. Seasonal distribution of rainfall, runoff, soil loss, and number of excessive-rate storms.

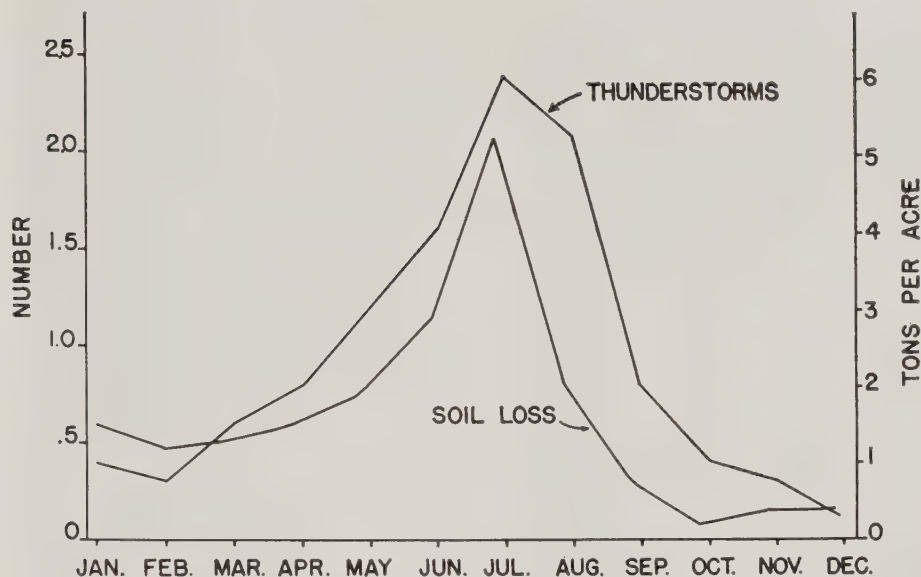


Fig. 3. Average monthly distribution of soil loss and number of thunderstorms.

rain in half an hour is considered an excessive rate.

We have established that the thunderstorm creates an erosion hazard and that it occurs most frequently during the warmer months of the year. The monthly distribution of erosion is shown in Figure 3. July is the most erosive month with August and June in second and third place. The monthly distribution of excessive-rate storms (thunderstorms) is also presented in Figure 3.

Over the last 20 years an average of 11 thunderstorms each year has caused 86 percent of the erosion and accounted for 56 percent of the runoff even though these storms contained only 25 percent of the rainfall. These 11 storms lasted about $21\frac{1}{2}$ hours each on the average, totaling only 28 hours each year, or slightly over one day out of 365.

It may seem fantastic, but it is true that our major erosion problem occurs at intervals that total but little more than one day's time out of 365. These facts are presented in Figure 4.

A considerable range in cropping practices, cover crops, and crop rotations has been tested on the Station's runoff plots. Early in the

tests it was found that row-cropping year after year gave inadequate protection even when combined with legumes such as vetch and crotalaria and all crop residues left on the land.

The next step was to design conservation cropping practices that would increase infiltration and reduce soil losses so that the rotation's average soil losses would be low enough to be considered "good conservation." Conservationists

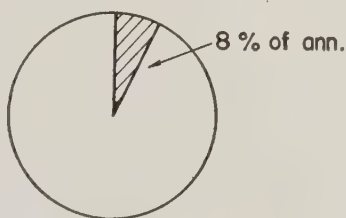
consider soil losses of three tons per acre per year to be satisfactory soil conservation on most Piedmont soils.

It was found that the direct protection of summer sod crops was highly effective in reducing soil and water losses. Also, the sod crops produced a surprisingly potent effect after being turned under. In brief, the function of effective sod cover crops includes increasing infiltration and percolation of water into the soil, reducing runoff and erosion, and, when residues have been turned under, improving the tilth, organic-matter content, and productive capability of the soil.

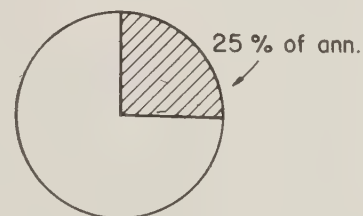
Of the many cropping methods and rotations designed and tested, the most effective ones have been based on volunteering annual lespedeza or tall fescue in rotations with cotton or corn.

A 3-year, lespedeza-based rotation that included (1) oats followed by Kobe lespedeza, (2) volunteer Kobe lespedeza, and (3) cotton followed by oats, was considered effective when used on Class IIIe land. It permitted an average soil loss of 2.6 tons per acre for a 12-year period. When used on Class IVe land with 11-percent slope, how-

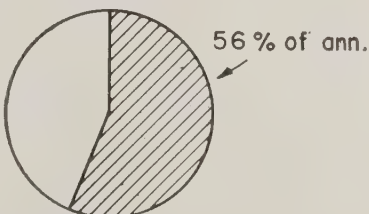
NUMBER OF STORMS = 11



RAINFALL = 12.1"



RUNOFF = 5.7"



SOIL LOSS = 17.2 t./ac.

Figure 4. The average number of excessive-rate storms per year and amount and percentage of total rainfall, runoff, and soil loss attributed to these storms.

ever, this rotation permitted an average soil loss of 4.8 tons per acre, which was not considered adequate protection.

A 3-year, fescue-based rotation, consisting of (1) oats followed by fescue and crimson clover, (2) fescue and crimson clover, and (3) corn, was effective for both Class III and IV land. It permitted only .5 ton of soil loss per acre per year on Class III land, and only .8 ton soil loss on Class IV land.

A 4-year, fescue-based rotation, that was the same as the 3-year rotation above except that 1 year of cotton followed the corn crop, was effective for Class III land. It permitted an average soil loss of only 1.3 tons per acre annually for the 4 years of the rotation. But nearly two-thirds of the total soil loss came during the year the field was in cotton, when the loss reached 3.3 tons per acre; and when a third consecutive year of row crop was

added to the rotation, the soil loss became prohibitive.

The outstanding results of conservation rotations, especially those based on grass sods, were largely due to the after-effects of the turned-under sod residue. Many measurements of fescue tops and roots to plow depth reveal that between 8 and 10 tons per acre of dry plant material are incorporated with the soil when a good fescue sod is turned under in preparation for planting a row crop. The extensive root system of fescue as well as the top growth decomposed slowly in the soil. The beneficial effects began to disappear in the second successive row-crop year; the runoff trend was upward and the erosion trend was sharply upward after two successive years of row-cropping.

In summarizing the significant results found during the 20 years of tests at Watkinsville, we find:

(1) Runoff and erosion vary greatly from year to year. This variation is closely related to the frequency of occurrence of excessive-rate or "thunderstorm" rainfall. The period of greatest erosion hazard is the summer months when 55 percent of the average annual erosion occurs.

(2) An average of 11 "thunderstorms" each year contain 25 percent of the annual rainfall, produce 56 percent of the annual runoff, and cause 86 percent of the annual soil loss from Cecil soil, capability class IIIe, in continuous cotton.

(3) Sod-based rotations have proven to be by far the most effective cropping system developed in the Piedmont for the control of both runoff and soil loss. They supply practical means for both protecting and improving our soils. They surely will occupy a prominent place in the conservation agriculture of the future in this area.

Browntopmillet for Wildlife

By Morris Byrd and W. C. Young

MORE than 200,000 pounds of browntopmillet seed was harvested in Mississippi, Louisiana, and Arkansas during the 1959 season. This crop is new to these States, but production has boomed as a result of its demonstrated value as a choice food plant for wild ducks. The millet has also been useful as food for bobwhite quail and mourning doves. A few farmers and ranchers have used it for hay.

As recent as 1956 there was no known production of browntopmillet seed in this area. Commercial

availability of seed had been erratic because of fluctuating demands. The primary source of seed had been in Georgia. Hence a district program for seed increase to stabilize production and provide a local seed source was started in 1958, and expanded in 1959. It was hoped that the demand for seed in this important duck flyway could be satisfied quickly. Several large plantings of 100 acres or more were sown. Other limited plantings were established by commercial seed growers.

Browntopmillet already was known and used in some areas of the Southeast for hay, grazing, and

wildlife, but suitable methods of planting and management were needed for local conditions in Mississippi, Louisiana, and Arkansas.

In 1957, with seed from SCS plant materials centers, field plantings were made first to test its adaption to soil and climate. The results that year led to increases in plantings for observation of its value for ducks and later for seed production. These phases of its testing have given excellent results.

In the field plantings, widely dispersed over the area, browntopmillet has proven to be suited to the climate and adapted to most

Note:—The authors are plant materials technicians, Soil Conservation Service, of Little Rock, Ark., and Athens, Ga., respectively.

soils. Browntopmillet must be planted where it can be flooded during the winter season for duck use. For bobwhites and doves, any open area is suitable. In the area studied, it has proven adaptable to soil conditions in the Grand Prairie of Arkansas, on the Coastal Prairie soils of Louisiana, on the Delta soils of Mississippi, and on most of the Coastal Plains soils in the three States. Inadequate drainage during the growing season has been the only limitation to successful management.

The crop does not demand heavy fertilization, though some fertilizer was used on most plantings. The fertilizer consisted of 5-20-20 on plantings in the vicinity of Lake Charles, La., at rates of about 100 lbs. per acre; 10-20-10 in the Grand Prairie area, Ark., at rates of about 200 lbs. per acre; and 5-10-5 on forested Coastal Plains of La., at rates of about 500 lbs. per acre. The analyses and rates of fertilizer were those commonly recommended for grain crops in that area. It was observed that on alluvial or more fertile soils, no additional nitrates were needed to produce adequate seed crops. But on the poorer soils, especially of the Coastal Plains, rates up to 100 lbs. of ammonium nitrate per acre were beneficial. Higher rates of nitrogen produced larger and more vigorous vegetative crops, but adversely affected seed yields. For better



Part of 100-acre planting of browntopmillet on the J. D. McGehee farm in Jefferson County, Ark., that later was flooded for duck food.

fertilizing practices both research and local experience will be needed for guidance.

Observations on time of planting occupied the attention of Service technicians and others in this area during the field planting stages. The plant's response to the length of day will make it seed at the wrong time if the planting date is not right. It was found that June and July plantings were best for this area. An average of 8 fields in 1958 yielded 1,700 pounds of seed per acre in the Coastal Prairie section of Louisiana from plantings in June and July. A July planting in the Bolivar County Soil Conservation District, Mississippi, yielded 2,700 lbs. of seed per acre. August plantings, on the other hand, yielded only 250 lbs. of seed per acre in the vicinity of Little Rock, Ark.

One field of 40 acres in the Lake Charles, La., area was sown by airplane in mid-June of 1958. This same field, after being combine-harvested, was flooded for ducks at the beginning of the season and supported about 7,000 ducks for the

first three weeks. It then continued to support about 100 ducks for the remainder of the season. This indicates that seed harvesting can be combined with actual use for wild-life purposes.

All field plantings of browntopmillet which were adequately managed and later flooded for ducks attracted and held them. In a few instances this did not occur until the shooting season was over. However, good hunting was secured on many areas.

Mr. Erle Barham, Bastrop, La., a cooperator with the Northeast Soil Conservation District, planted 16 acres of browntopmillet in 1958, and had 1,000 mallards and good hunting. Examination of the craws of some of the ducks showed they were feeding heavily on the browntopmillet.

Buddy Gayle, Cameron Parish, La., had a 40-acre planting that fed 700 ducks, while a 15-acre field at Sheridan, Ark., supported 200 to 300 mallards for the season. Bill Byers, of Hunter, Ark., counted several hundred doves in one 8-acre field.



A July planting of browntopmillet near Esterwood, La., 44 days after planting.

Mulch Planting of

By T. H. Hilliard



Frank Proctor (right) and W. L. Zetterower watch mulch planting of soybeans on Mr. Proctor's farm in Bulloch County, Georgia. The combine in the background is harvesting oats that yielded 90 bushels per acre. The planting is done right behind the combine to get the seed in the ground before the sun dries out the soil, thus giving the beans a chance to emerge before weeds can get started. Planting was completed in this field about 2 hours after combining the oats was finished.



Frank Proctor (left) and E. T. Mullis, SCS work unit conservationist, examine the freshly planted soybeans. The large amount of oat straw mulch checks weed growth in the middles and helps prevent soil moisture evaporation. This mulch is left undisturbed until the last cultivation, at which time it is cultivated to hasten decomposition.



E. T. Mullis (left) is standing in a patch of soybeans that were planted on unmulched land, while Proctor is in an area where there is oat straw mulch. The absence of mulch is the main reason for the terrific weed problem at the left, since planting, cultivation, and fertilization practices were identical. This photo was taken after the second cultivation.

Soybeans

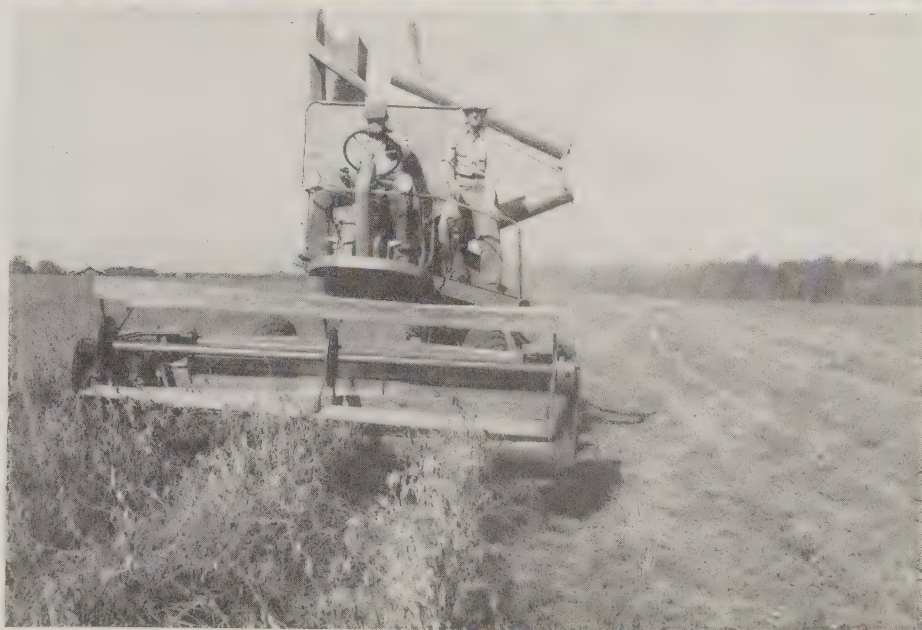
Frank Proctor (standing), J. T. McAlister, conservation equipment engineer, and E. T. Mullis examine the soybeans after the first cultivation. Notice the absence of weeds in the middles, even though they have not been plowed. Also, notice that soil moisture is just beneath the mulch that was lifted by McAlister, even though there had been no rain for 10 days.



Mullis, Proctor, and McAlister examine the field after it has been "laid by." The middles have now been leveled by plowing, so that the beans may be efficiently combined. The oat straw mulch is in an advanced stage of decomposition.



The soybeans were combined and yielded 30 bushels per acre. This was several bushels per acre more than was made on neighboring fields that were planted in the conventional manner. Mulch planting decreased the cost of planting and cultivation, and greatly reduced soil erosion. Furthermore, it enabled the owner to plant immediately following the oat harvest.



Note:—The photographer and author of this picture story is work unit conservationist. Soil Conservation Service, Glennville, Ga. This sequence of pictures won an award for being the best photographic essay submitted by SCS employees in Georgia during 1959.

Mulching Flood Prevention Structures

By William L. Smith

MULCHING flood prevention structures with grass hay to protect the slopes and speed up the establishment of grass cover is a common practice in Texas.

Structures on which grass is established by dryland seeding are mulched prior to seeding. Where grass cover is established by planting vegetative parts of plants such as bermudagrass rhizomes, mulching is not required.

Approximately 81 structures in Texas projects have been mulched to hasten establishment of vegetative cover. The anchored mulch protected against soil loss from immediate heavy rains, and with few exceptions a good stand of grass has been secured without irrigation.

Prairiegrass, marshgrass, Medio bluestem, King Ranch bluestem, and Buffelgrass hays have been the most successful for mulching. John-

Note:—The author is management agronomist, Soil Conservation Service, Denton, Tex.



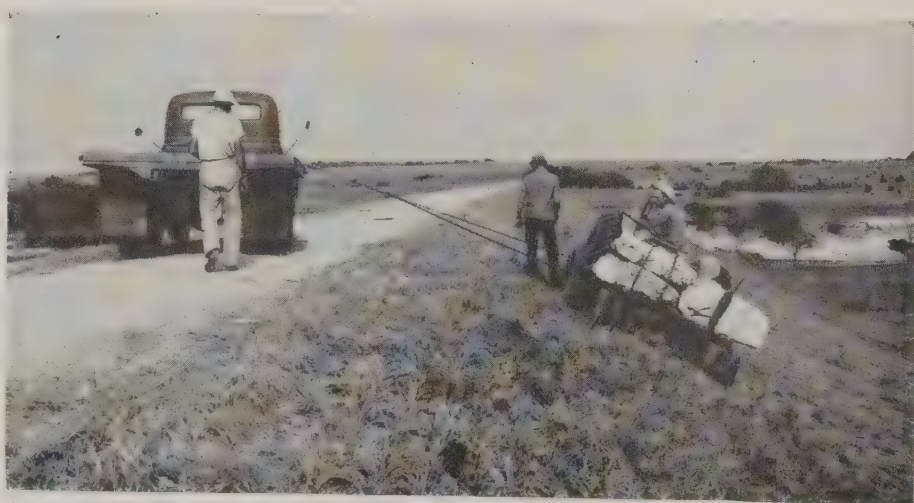
Spreading hay mulch at a rate of about 4,000 pounds per acre on damsite 1, Deep Creek watershed.

songrass, sorghums, and small grain straws are too brittle for anchoring and usually produce a crop of weeds and grain competitive with the grass seedlings. Mulch hay must be durable, with at least 50% of the hay 10 inches in length or

longer. Most hay lasts a minimum of one year before decomposing. In areas of lower rainfall and without fertilizer, the mulch lasts longer. Marshgrass hay has lasted four years in some of the drier areas.



A shop-made mulch tiller tool with about 1,000 pounds of rock on it to give necessary weight for pressing hay into the ground.



Anchoring hay mulch with mulch tiller held on the slope by a truck and winch line, Sulphur Creek watershed.



Dam and spillway with newly anchored mulch which has been overseeded with grass, site 2, Sulphur Creek watershed.

The rate of hay mulch usually is about $2\frac{1}{2}$ tons per acre, where anchored. If held in place by strings or netting, $1\frac{1}{2}$ to 2 tons per acre is adequate. The objective is to apply just enough mulch to control erosion and not inhibit the germination of the seed and growth of the grass seedlings.

A good seedbed, free of clods and stones, prepared to a depth of 3 to 4 inches, is necessary so the hay can be anchored into the soil. A tillage tool followed by disking will in most cases prepare a good seedbed. The seedbed should be firm underneath the 3- to 4-inch prepared depth. Breaking with a moldboard or dryland disk plow would normally prepare a seedbed too deep and loose for planting grass.

The hay is spread uniformly over the area to be seeded, usually by hand. When wind velocity reaches 15 miles per hour with gusts up to 20 miles per hour, spreading the mulch becomes impractical. Mechanical mulch spreaders have been used but spreading by hand labor is the common method.

Immediately after the mulch is spread it is anchored by tucking it into the soil with a mulch tiller tool. This implement is a special-purpose tool equipped with flat, sometimes serrated disks, $\frac{1}{4}$ inch

in thickness, 20 inches in diameter, and spaced 9 inches apart. Weight is applied to the frame of the tiller and when drawn slowly across the mulch hay presses it into the prepared seedbed to a depth of 2 to 3 inches.

The structures usually are mulched as soon after construction as possible, regardless of the season of the year. This may be immediately preceding the seeding or as much as 8 months before seeding. The seeding is timed so as to plant only during the optimum planting

time for the grasses.

The grass seed is drilled directly into the anchored mulch with as little disturbance to the mulch as possible. A cultipacker drill is used if the seedbed has not been firmed by rain.

The mulch prevents rilling, sheet erosion, and crusting of the soil surface on the dam. It speeds germination of the grass seed and the artificial cover conserves moisture and lowers soil temperature, which helps the small seedlings to survive during hot, dry summer months.



This good grass cover was established in one growing season on a dam in the Cummins Creek watershed. The site was mulched well before the grass was planted.

How to Install a Pipe Overfall

By Larkin B. Agnew

A pipe overfall, as commonly used in conservation work, is a structure placed in the outlet end of a drainage ditch, waterway, diversion, or irrigation water discharge point to drop water safely into a deeper canal or stream. Pipe overfalls in small drainage ditches will be considered in the following discussion.

There are two main advantages to the pipe overfall. First, it prevents gullying in the drainage ditch. Without protection, a ditch may erode from a few feet to several hundred feet back from the main outlet canal. This depends upon the erodibility of the soil, the amount of water carried by the ditch, and the difference in elevation of the ditch and main canal.

The second advantage of the pipe

overfall is that it increases the life of the outlet canal. The eroded soil from an unprotected ditch settles in the outlet canal, and forms a silt bar. This silt bar reduces the effective carrying capacity of the canal. A number of unprotected ditches will greatly increase maintenance costs on larger canals.

A pipe overfall structure which a farmer can afford is shown in various stages of construction in the accompanying pictures. This type of overfall is adapted to handle drainage areas up to 300 acres, and a total overfall of 10 to 15 feet. The fall from the bottom of the outlet end of the pipe to the bottom of the outlet canal should be limited to about 6 feet. If the

fall is greater, then the overhang of the pipe must be greater and will reach an unsafe length. Additional fall, above 6 feet, should be taken up by adjusting the difference in elevation of the inlet and outlet ends of the pipe.

This pipe overfall installation was made on the C. L. Younger farm near Alexandria, Louisiana. It was installed in the fall of 1959, under the supervision of the Soil Conservation Service, and is the drainage outlet for 273 acres of Red River bottomland. The total cost of the pipe, concrete, anti-seep collar, and reinforcement steel was \$498.85. Mr. Younger says that it was money well spent.

A pipe overfall of this type should give many years of trouble-free service if adequate maintenance is provided.

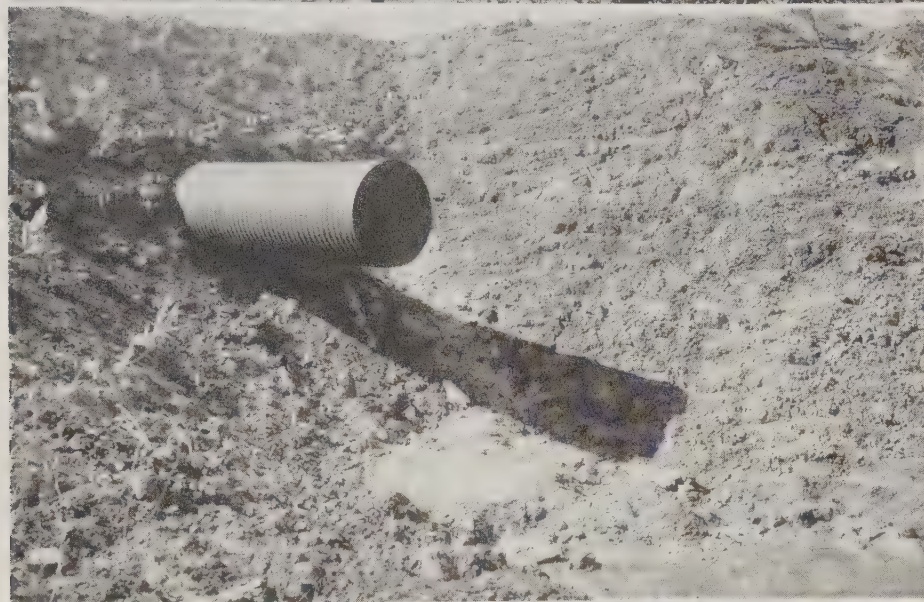
Note:—The author is agricultural engineer, Soil Conservation Service, Alexandria, La.



After proper trenching and grading, the pipe was laid on undisturbed soil. If this is impossible, the fill material should be packed tightly before the pipe is laid on it. Since the bottom of the farm ditch was about 9 feet higher than the bottom of the canal, the pipe was laid with a drop of 3 feet from inlet to outlet end. The anti-seep collar was attached after the pipe was in place. Fill material was tamped tightly around the lower part of the pipe. After this, the remainder of the fill will be made with a bulldozer.



A side ditch, 15 to 20 feet long, was cut from the main outlet canal. Water from the pipe spills into this recessed ditch. The purpose of this recessed area is to prevent damage to the structure by the movement of water and debris in the main canal, and to prevent the overhanging pipe from retarding water flow in the canal.



An important part of a pipe overfall structure is proper overhang of the pipe. The drop from the bottom of the pipe to the bottom of the canal should not exceed 6 feet, as in this installation. The slope of the bank, from the bottom of the recessed ditch to the pipe, should be as steep as can be excavated and still have a stable bank. The water coming out of the pipe should discharge beyond the toe of the slope.



The "island" method of installation was used; that is, the fill directly over the pipe is higher than the ground on either side. Thus, in case of an extremely heavy rain that causes the ditch to overflow, the water will run around either side of the "island" and not wash out the structure. The concrete headwall at the inlet end of the pipe adds stability, cuts down the danger of seepage, allows use of a shorter pipe, and prevents scour around the pipe.

Grass Better Than Wheat

on a Northern Plains Farm

By Walter N. Parmeter

"High-producing beef cattle on good range and pasture land will make a larger net profit than small-grain farming in this area," says Warren Glaus, cooperator with the Brule-Buffalo Soil Conservation District in South Dakota.

During the past five years Glaus has planted 550 acres of his cultivated land to tame grasses, which he uses for hay and pasture. His father started this practice of growing more grass by shifting cultivated land to tame grasses in 1939. Warren now has only 150 cultivated acres which he uses for sorghum and corn silage. His 85-acre wheat base is planted on rented land.

The cultivated land on the Glaus



Warren G. Glaus, left, and Larry Kehrwald, SCS technician, examine native grasses on one of Glaus' ranges. Missouri River in the background.



Three-year-old Angus heifer with calf in a tame grass pasture on the Glaus ranch.

farm has deep soils of medium texture on the uplands, and from medium- to heavy-texture soils in the low areas. The 1,200 acres of native grass range, which lies on the brakes of the Missouri River, has silty clay to dense and shallow clay soils.

The cattle are pastured on the cool-season tame grasses early in the spring during calving time, and again in the fall, giving the native grasses ample rest to keep them in excellent condition. Both the native grassland and the tame pastures are divided so that the cattle can be moved often enough to keep the grasses at a height conducive to rapid growth.

Note:—The author is management agronomist, Soil Conservation Service, Huron, S. Dak.

Better Woodland Through Water Control

By Edwin C. Wilbur

"I like to plant 4 pounds of crested wheatgrass, 4 pounds of smooth brome grass, 4 pounds of alfalfa, and 2 pounds of sweet clover in my mixture of tame grasses," says Mr. Glaus. In many of his tame grass pastures the crested wheatgrass is now predominant, with a sprinkling of alfalfa and some brome grass in the low areas, while the sweet clover has almost disappeared.

"By good pasture management I have not had to replant my grasses and I have little worry about drought, as there is always plenty of pasture and hay to carry my herd," Warren states. He plans to carry about 150 Angus cattle, of which half will be registered livestock and the rest commercial cattle on which he will use purebred bulls.

Mr. Glaus is now a director of the South Dakota Livestock Production Record Association. Through this association he culls the lower one-sixth of his herd each year and puts them on the market. The association requires that each new calf be ear-tagged with a number, date of birth, and the number of the dam. The calves usually are weaned in about 190 days, at which time each calf is weighed and the weight is averaged to get the rate of gain. The calves that have made the best gain and the cows that produced these calves are the ones that remain with the herd. A cow is kept until it no longer produces a calf with ability to make rapid gains. Type is also considered at the time the calves are selected. Those calves of poor type are discarded even though they have made a good gain.

The Warren Glaus farm was one of the first farms in South Dakota to come under the Great Plains Conservation Program. His plan includes terracing, cross-fencing for better pasture management, and tree planting, together with dams and dugouts to better utilize the pastures.

THE Lower Neches Soil Conservation District in southeastern Texas has taken the lead in showing how water control can be applied to woodlands where excess water is a major problem in the production of wood products.

There are 527,000 acres of woodland in the Lower Neches district, mostly in private ownership. A recent conservation needs survey showed that excess water was a major problem on approximately 409,000 acres, or 70 percent of the total agricultural land in the district.

The Dishman-Lucas Estate became a cooperator with the district in February 1957. A request for

technical assistance was made by Mr. Phillip Lucas, who stated that the main problem on his woodland tract was drainage. The complete soil and water conservation plan developed by SCS technicians and Mr. Lucas included a water control system for the 2,260-acre woodland tract.

Prior to 1957, this woodland tract was a cutover stand of mixed hardwoods and scattered pine. Surface water covered most of the tract for 4 to 5 months out of the year to a depth of 6 or 8 inches. Natural pine reproduction was drowned out and planting of seedlings was impractical.

Logging operations were hazardous and expensive because of flooding. The pine, gum, and other

Note:—The author is woodland conservationist, Soil Conservation Service, Rosenberg, Texas.



Primary water control ditch on the Dishman-Lucas woodland tract.

merchantable species were showing little or no growth.

That was the situation before a planned woodland water control system was installed. Today part of the tract has been drained, undesirable hardwoods have been deadened, and pine seedlings have been planted in the openings to insure a fully stocked stand of pine for future timber harvests.

The first step was to clear a right-of-way for construction of drainage ditches. About 12 acres were cleared at a total cost of \$1,200. All the primary ditches were designed 4 feet wide at the bottom and 2 feet deep with 2 to 1 side slopes. The ditches were built with a dragline at a cost of 20 cents per cubic yard. A total of 7,887 cubic yards of dirt was moved in the construction of 20,275 linear feet of ditches.

Structures were built to stabilize water levels and control surplus surface water on some 800 acres at a cost of \$3.75 per acre. The remaining acres in the tract will be similarly treated.

The intensity of water control needed on woodland is not nearly so great as on cropland. Primary ditches were spaced from 1,000 to 1,300 feet apart. Internal drainage developed naturally and laterals were used only where there was an obvious need.

Since the water control system was installed on the Dishman-Lucas woodland tract in July 1958, many benefits have been noted by foresters, technicians, and numerous landowners who have studied the operation. The main advantages noted were:

Dirt removed in ditching operations were piled in such a manner that openings are left approximately every 100 feet, permitting lateral movement of water into the ditches.

Water control makes it practical to install woodland management



Slash pine plantation on the Dishman-Lucas Estate. All trees are the same age; but those on the low, wet area in the foreground are only 3 to 4 feet tall, while those on better drained land in the background are about 12 feet tall.

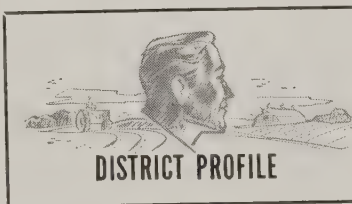
practices and increases accessibility for logging operations.

The ditches serve as excellent firebreaks and divide the woodland acreage into workable management blocks or compartments.

The water control work has benefited wildlife. Removal of surface water has improved the natural habitat for wildlife by providing better sources of food and

cover for all kinds of native wildlife. Ducks, particularly mallards and woodducks, are attracted to natural ponds in the woodlands which have acorns, cypress seeds, smartweeds, and other kinds of desirable food.

The most important benefit of water control, however, is that it makes possible the growing of a better class of timber.



John M. Bryant of California

JOHAN M. "Jack" Bryant farms about 1,200 acres of rich southern California farmland in the Imperial Valley. A native of Eureka, Calif., Jack spent most of his early years in northern California and southern Oregon. He came to Imperial Valley in 1926 to work as a fruit packer. In 1930 Bryant rented some land and

started farming on his own on a small scale. His first land purchase was made in 1935—80 acres near Calipatria.

In addition to personally overseeing his extensive farming operations, Jack has taken an active part in soil conservation and civic affairs in his home town of Calipatria and Imperial County.



John M. Bryant at a water control structure in one of his irrigation ditches.

He has served since March 1949 as a member of the board of directors of the Imperial Irrigation District, one of the largest irrigation districts in the world, and as board president since April 1957. He recently was elected Chairman of Area 8 of the California Association of Soil Conservation Districts. He served as a member of the Agricultural Stabilization and Conservation Committee for 4 years.

The Imperial Irrigation District acts essentially as a soil conservation district. Members of the irrigation district board of directors serve in a dual capacity as soil conservation district directors.

Within the area of the Imperial Irrigation District there are about a half million acres presently under irrigation. The district is a "tail-end" irrigation system. Upstream on the Colorado River irrigation projects remove fresh water and return drainage water to the river.

Thus as the river flows south the salt content increases. Water reaching Imperial Valley farmland carries about a ton of salt per acre-foot.

Jack said, "Salinity is our major problem. Local farmers realize that tile drainage is our only solution. The more tile we get in the ground, the better we will be able to leach out harmful salts."

A pioneer in the installation of tile, Jack was foreman for a rancher who brought the first tile-trenching machine to Imperial Valley in 1932. Since that time about 7,200 miles—38 million feet—of tile have been installed under about 250,000 acres of land. A tile machine has recently been developed for Imperial Valley contractors that will lay a 24-inch tile line 12 feet deep at the rate of 600 feet per hour.

All of the 1,200 acres that Bryant farms are now under a soil con-

servation plan, with the following practices installed: 6 miles of concrete ditch using a gravity flow; 40 miles of 4-, 6-, and 8-inch tile drain installed at an average depth of 6 feet; and all 1,200 acres stake-leveled for good water management.

About 3 miles of concrete ditches on Jack's property have small drops installed to slow down the flow of water. Water is siphoned from the ditches by using 20 to 25 1¼-inch metal siphons between drops.

Normally his crop rotation is alfalfa, barley, flax, and cotton. Alfalfa usually stays on for three years. All his land is planted to a green manure crop every 6 years. Jack uses Sesbania (hemp) which grows to about 6 feet and is plowed under.

At the present time he is growing 640 acres of alfalfa, 80 acres of sugar beets, 320 acres of Delta Pine cotton, and 160 acres of blue panicum grass as permanent pasture. Jack averaged 3.74 bales of cotton an acre in 1959, and will pasture between 7 and 8 head of cattle per acre on the blue panicum. He averaged 5 to 6 tons of hay per acre plus pasture on his alfalfa and 25 tons with about 16 percent sugar on his beets last year.

His foreman has worked for him for the last 14 years. In addition, he employs two tractor drivers and two irrigators on a full-time basis. Crews of Mexican contract laborers, known as braceros, are brought in from time to time to thin and harvest crops.

—ALEX GAY

Mr. S. B. Huff, chairman of the board of supervisors of the Greenville Soil Conservation District (S. C.), recently said: "I don't see how a farmer can sit on a front seat in church on Sunday and then go out in his field on Monday and plow up and down hill."

Early Streambank Stabilization

By Paul Tabor

A description of streambank stabilization given in 1776 by Dr. James Anderson of Scotland should be interesting to those engaged in modern watershed work. It consisted of sloping unstable streambanks, above and below the waterline; sodding or seeding the slope above with grass; and planting aquatic vegetation at and below the waterline. The method is given in his *Essays Relating to Agriculture and Rural Affairs*, 5th edition, volume 1, pages 121-129, published in London in 1800. His description follows (non-essential portions have been omitted).

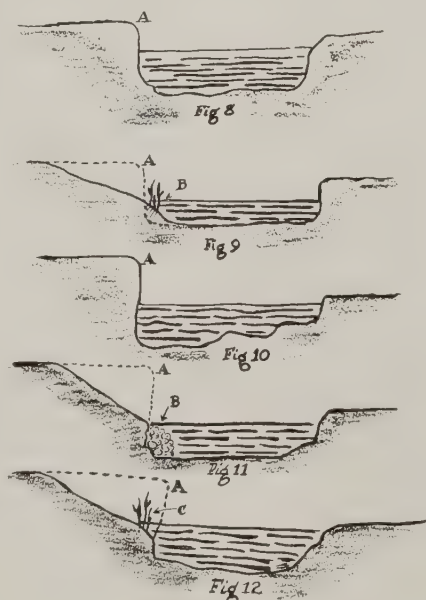
"It frequently happens that when a river runs in a bed of rich vegetable mould, the least accident that may chance to divert the stream towards any particular part of the bank, causes it to sweep away large tracts of fine ground....If you carefully observe the banks of rivers, you will readily remark that these ravages are always most considerable...where the bank rises perpendicularly to a pretty considerable height...the first and most necessary step toward a cure is to level down the edge of the bank that is next the water, so as to make it slope gradually down toward the river....This operation ought to be performed as early in summer as possible; and the slope should be either immediately covered with turf....or....sowed very thick with the seeds of some small mat rooted grass...

"If the stream has not been extremely rapid at the foot of the banks, some of the earth that was thrown into the water will....form a bed of loose soft earth....The

surface of this....ought to be instantly stuck full of the roots of bog reeds, flags, water spiderwort, rushes and other mat rooted aquatic plants; which if allowed to remain till they have once struck root, will afterwards form a barrier that nothing will ever be able to destroy. (See Fig. 8, which represents a river with a high bank A; and Fig. 9, where the same bank is cut into a slope, and part of it thrown into the river, and aquatic plants growing thereon at B.)

"But if the stream be too rapid to admit of this, and the bank of soft earth is much deeper than the surface of the water (as in Fig. 10) it will be of great use to fill up the breast of the bank, with small loose stones....which would most effectually secure it against any future encroachments if the bank is sloped away above as in Fig. 11.

"But if....stones cannot be easily got for this purpose....dig the bank....below the surface of the water and carry it out in this



Note:—The author is plant materials specialist, Soil Conservation Service, Athens, Georgia.

way a considerable distance, and then stick the whole surface.... below the water, full of mat rooted aquatic plants, strewing it over... with a thin bed of small gravel or sand....

"This bank ought to continue to shelve downwards, even where it is below water, as at Fig. 12; and those aquatics that will grow in the greatest depth of water, ought to be planted on the innermost brink, and others behind them....

"N. B. where the current is considerable, these aquatic plants ought always to be cut down with a scythe before winter, otherwise they may run a risk of being caught by the ice and torn up by the roots when a thaw comes, which would give access to the water and endanger the embankment."



THE CONSERVATION OF NATURAL RESOURCES. By Richard C. Haw. 225 pp. 1959. Faber and Faber, Ltd.: London. 30s.

TO realize what this book must mean to conservation-minded people in Africa, you would have to close your eyes and imagine yourself a bush farmer with a large family—or a tribal chieftain with a hungry tribe—and the desert stealthily slipping up on you. It is the Dark Continent's first and, thus far, only textbook on conservation of land resources. In addition to being a first text, it is a good one, and it fits Africa.

For American readers, the book's outstanding feature is its skillful simplification of the technicalities and scientific findings that have gone into chapters describing soil and water conservation methods suited to African land problems.

Emphasis is on fitting mechanical practices to topography, rainfall, soil permeability and depth, and keeping the soil covered by all vegetative practices possible in dry regions. A special treatment of good land use, including veld management, rotations, leys and strip-cropping, and tillage with mulching to keep the soil's organic matter content as high as possible, is well handled from the standpoint of experiences in the Rhodesias and South and Southwest Africa.

The farm plan, as a guide to both land use changes and future development of virgin land, is treated very simply in conjunction with land classification and basic map requirements. This section is credited to the U.S. Soil Conservation Service's Survey Division and the Department of Conservation of Rhodesia.

An appendix lists conservation uses of more than 300 trees, shrubs, legumes, and grasses for conservation purposes in Africa's warm and arid regions. The text also contains 36 photographic illustrations and 35 diagrams for pictorial explanation of mechanical structures, field designs, and land study tools.

The first chapter, although only a few pages, is somewhat of a gem of beautiful writing. It starts with the statue of Cecil John Rhodes in the Cape Town Gardens, pointing northward—"There is your hinterland." It treks through the Union, the Federation of the Rhodesias and Nyasaland, Mozambique, the Congo, Kenya, Uganda, Sudan, Egypt, pointing to dying land. "These are the stimuli for this book. Africa can still be saved, and is worth saving." We hope Mr. Haw's book travels all the way, and we think it will have an important part in showing more and more Africans the responsibilities awaiting them with regard to their vast land. The text also can be a valuable reference in other countries with conditions similar to those of Africa.

—PHOEBE HARRISON

THE NATURE AND PROPERTIES OF SOILS. By Harry O. Buckman and Nyle C. Brady. 567 pp. Illus. Sixth edition, revised. 1960. Macmillan Company, New York. \$7.95.

A new edition of the classical Cornell text on soil science is always welcome. For nearly 40 years this has been a standard text in most American colleges for the first course in soil science, commonly presented in the sophomore year.

Through the years the authors have been able to write soundly on the basis of the results of scientific experiment and still not overreach college sophomores. The revisions for this edition are chiefly in the discussions of soil water, nitrogen, pH, micronutrients, weathering, clay minerals, and soil survey.

With our continually expanding knowledge of basic soil science and of the soils of the world the task of maintaining a proper balance without undue length has become increasingly difficult. Probably none of us would have handled the problem in the same way. This reviewer, for example, could have wished for a bit more about the management of tropical and desert soils. Yet few, if any, of us could have done better for the majority of American students.

Certainly this 6th edition will continue the distinguished record of service to those beginning in soil science.

—CHARLES E. KELLOGG

MANUAL FOR OUTDOOR LABORATORIES: The Development and Use of School Grounds and Outdoor Laboratories for Teaching Science and Conservation. Edited by Richard L. Weaver. 84 pp. Illus. 1959. The Interstate Printers and Publishers, Inc.: Danville, Ill. \$1.25.

Here's a new and practical book, the second in a series for teachers

and conservation leaders put out by the Conservation Committee of the National Association of Biology Teachers.

The first in the series, also edited by Dr. Weaver, was "The Handbook for Teaching Conservation and Resource-Use."

This new manual contains 16 articles giving suggestions for teaching science and conservation. Teachers of the middle and upper elementary grades and high school will find it helpful, as will leaders of youth groups.

The well-illustrated manual describes ways and means of establishing outdoor laboratories, features to emphasize, and the use that can be made of the areas. For example, it contains suggestions on how to have a school garden, how to erect a weather station, and how to plan better outdoor laboratories.

Dr. Weaver's article, "Schools Unlimited: Suggestions for Tomorrow's Progress," has plans for schoolground laboratories and points out the need for erosion control and soil study. It urges community cooperation.

An article by Albert B. Foster tells how a science teacher at Belle Valley High School in southeastern Ohio solved school water problems and created an outdoor laboratory.

Other articles include "Landscaping a School to Attract Wildlife," by Frank V. D. Cortelyou; "Preparing for a Land-Use Survey of School Grounds by a Biology Class," by John W. Brainerd; and "School Ponds for Biology Teaching," by Henry R. Russell and John W. Brainerd.

"The Broad Creek Conservation Program," by George P. Graff, will be of interest to leaders of youth groups. It tells how more than 2,600 Boy Scouts and Explorers were introduced to conservation during an 8-week summer camping season.

—ADRIAN C. FOX

CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER

CONSERVATION NEEDS INVENTORY

The National Inventory of Soil and Water Conservation Needs is the most comprehensive, cooperative effort ever undertaken to determine facts about the Nation's land resources and need for conservation treatment. In 1956 the Secretary of Agriculture directed eight Department agencies with responsibilities in land use, soil, water, forest and woodland, and pasture and range conservation to conduct the Inventory.

Committees were organized in the States to guide and direct local committees in the development of the Inventories in the 3,000-plus counties of the United States. In addition to the Department of Agriculture agencies, other Federal, State, and local agencies had membership on the State and county committees. Thus, the Inventory estimates include local thinking as to conditions and trends.

The Inventories were completed in all States early in 1960. The Department Committee is in the process of reviewing the Inventories for comparability and consistency within the States and counties. Many of the States are expected to publish Inventory results before the end of 1960, and complete Inventory results for the Nation will be available in early 1961.

The kind of information that will

be available from the completed Inventory includes: (1) Basic data in tabular form for each county that show kind of soil, slope, erosion, and land use. State summary tables are also being prepared. (2) Present (1958-59) and expected land use (1975) by land capability subclasses for each county and State totals. The land use classification will be for cropland (irrigated and non-irrigated in 17 Western States), pasture and range, forest and woodland, and "other." (3) Acreage of cropland needing treatment and feasible to treat by dominant kind of problem; i. e., erosion, water, soil, and climate (irrigated and non-irrigated separated in the 17 Western States). (4) Pasture and range needing treatment through seeding, management, water developments, and water conservation. (5) Forest and woodland needing establishment, improvement, protection, and/or management of timber stand, and establishment of windbreaks and shelterbelts. (6) Other land needing treatment: same type of data as for cropland. (7) All watersheds in the United States delineated to 25,000 acres or less (some 15,000) with problems that are applicable under the small watershed act. Data will show kind of problem and whether or not "project action" is required for solution of these problems.

The information obtained from the Inventory will be used in planning and carrying forward the many conservation and land use activities of local, State, and Federal agencies and groups as well as individuals.

Productivity of farm workers in the United States is growing more than twice as fast as that of industrial workers. Since 1950, output per man-hour in non-agricultural industry has risen about 2 percent a year; in agriculture it has risen 5 percent per year.

Farm capital investment per worker last year averaged \$20,700, compared with an average of \$15,300 per worker in manufacturing. On highly mechanized farms in the Corn Belt, average investment was even higher.

In minimum tillage tests conducted by the Ohio Agricultural Experiment Station, corn yields from minimum-prepared seedbeds were equal to or greater than those from conventional seedbeds, and soil losses were much lower.

Barley seems to be more susceptible to soil acidity than other small grains, according to research conducted by agronomists at the Virginia Experiment Station. They recommend a pH of 6.0 to 6.5 for barley.

OCTOBER 1960

Soil Conservation



SOIL CONSERVATION SERVICE • U. S. DEPARTMENT OF AGRICULTURE

CONTENTS

PAGE

- 51 Hugh Hammond Bennett
By Wellington Brink
- 53 What Others Say About Hugh Hammond Bennett
- 54 Cranberry Production in the Pacific Northwest
By Earl R. Baker
- 56 Land Improvement Through Brush Control
By Harry M. Elwell
- 60 Conservation Bivouac—The Fifth Boy Scout Jamboree
By Donald A. Williams
- 63 Scout Conservation Activities
By Irving J. Feist
- 65 5,629 Cooperators
By John C. Beard
- 67 Contractor Plays "Boy at the Dike"
- 68 Missouri's Little Dust Bowl
By Gaylord H. Wisner
- 70 F. S. Hurd of Oklahoma—A Profile
By Wilber E. Parrish
- 71 The Mail Goes Through
By J. S. Livingston and J. F. Murphree

"Productive land is our base. Everything we do, all we share, even whatever we amount to as a great and enduring people, begins with and rests on the sustained productivity of our agricultural land."

—HUGH HAMMOND BENNETT



COVER PICTURE.—H. H. Bennett displaying some of his garden produce, at his home near Falls Church, Va., in the summer of 1951, just a few months before his retirement from Government service.

Soil Conservation

EZRA TAFT BENSON
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

TOM DALE, Editor

15 CENTS PER COPY

FOREIGN—\$2.25 PER YEAR

\$1.50 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Hugh Hammond Bennett

1881-1960

HUGH Hammond Bennett died of cancer in Burlington, N. C., July 7, 1960, at a mellow 79. He rests in the grass-green beauty of Arlington National Cemetery, the honored hero of a different kind of global war. With his passing, the extraordinary Bennett legend becomes an immortal page in the history of civilization.

Many there are to mourn. They will miss his wise counseling and easy companionability. He was my own dear friend. In a very real sense, he was a friend as well to all the world's millions toiling out on the land. For he was a messiah of the soil, in whose teachings lay hope of plenitude and peace for hungry and quarreling peoples.

In what is but the flicker of an eyelid on the face of Time, Hugh Bennett was able to halt and reverse the exploitative trend on American farms and ranches, and to stay the hand of ruin in many another nation brought low by ruthless plow, hoe, fire, and axe.

He was a man of action, an organizer, and an administrator who got the most out of men and dollars. He was a militant crusader of thunderous voice and flashing rapier. He was a shirtsleeve philosopher of prodigious memory and ready wit, a raconteur of the Mark Twain stripe. A practical psychologist, he knew how to deal with both the legislators on Capitol Hill and the executives in posts of government. And he was master of the art of communicating himself and his ideas to the mind and conscience of the people.

He was all of these things. But first and last, Hugh Bennett was a scientist—dedicated, inspired, and unique. As a young chemistry graduate of the University of North



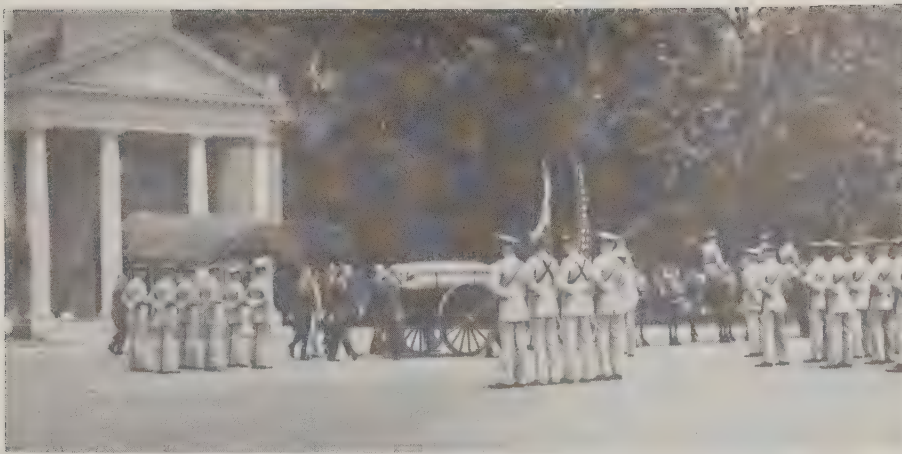
Carolina, he pioneered a form of research which led him into the dark jungles of ignorance and many a bureaucratic ambush.

His story has been told a thousand times in magazines, in newspapers, in books, on the air, and by neighbor to neighbor. Well do we know the epic studies he pursued in Virginia and the Carolinas, in Alaska, in Central and South America, in Africa. What he discovered confounded and sometimes embarrassed the established order.

It was not Bennett's chief aim to confound or embarrass his superiors. He was by no means the sort of iconoclast who delighted in smashing images, however false. But he was alarmed and appalled by steadily diminishing harvests, by the weakening agricultural complex, and by wasted, dying soils—

and angered by the indifference to the catastrophe on the part of those who should have known better. He felt that his duty was to unveil the truth and collate the facts, no matter how damning the evidence or how disturbing the deductions might be to the whole existing formula for land management.

The young soil surveyor paid a big price for his tenacity and brashness. His reports were printed, discounted—and largely ignored. He began to supplement his official reports by scholarly papers in professional journals, by articles contributed to the farm press and general magazines, and by addresses before scientific bodies. Little by little, he fanned the flame of interest and concern. Gradually, he acquired a following, gained adherence of a hard core of



Horse-drawn caisson carries the body of H. H. Bennett to its final resting place in Arlington National Cemetery.

respected technicians and scientists.

After nearly a score of years of dogged effort came a dramatic breakthrough with publication of the celebrated "Soil Erosion, a National Menace." This bulletin made a convincing case against the crime of man's long war against Nature, exposed the thievery of sheet erosion. It was the blast that knocked down the remaining palace guard and smashed the bastion of complacency.

Over the Nation the oncoming shadow of trouble was compounded: the unsolved farm problem, the Great Depression, drought and Dust Bowl. Bennett was the outstanding leader with the knowledge, experience, courage, and vision to lead the fight against accelerated soil erosion. Congress and the White House tapped him for the job. First, he was to establish a system of experiment stations to continue the investigations he had begun. Next, he was enjoined to make erosion reconnaissance surveys and set up demonstration projects under WPA. Finally, with the praise of the President ringing in his ears, he was told to bring his Soil Conservation Service back over to his old Department of Agriculture as a permanent organization—an organization which was destined to become a model for most of the world.

Hugh Bennett went far beyond

the simple mechanics for prevention of soil and water losses. He and his colleagues devised an entirely new philosophy of land management. It called for putting every acre to its proper use and treating it according to its needs. Its aim was as much production as protection—continuous, undiminished, most nearly maximum production. His transilient concept involved the whole agricultural ecology. In application it knew no separation of farm from farm by metes and bounds. And inevitably it led to the further revolutionary idea of soil conservation districts—those legal political entities which now are common to all States, and which constitute the most refreshing manifestation of grass-roots democracy of our day.

The soil conservation movement was the Hugh Bennett dream come true. It was sound, imaginative, challenging. It was swept along by a team of technicians and farm leaders who saw things as he did, were fanatically loyal, and shared his messianic zeal. He was proud of that team and its accomplishments.

Said the distinguished Paul Sears: "The campaign to protect and restore our soil is in some respects the most dramatic event in American peacetime history since the winning of the continent. It differs from all great national epi-

sodes which have preceded it in the degree and steadfastness with which it utilizes scientific knowledge."

Millions of men, women, and children came to know and love their idol. To them he was "The Chief" long before he was affectionately knighted "Big Hugh" by his biographer. He towered on the horizon heroic and invincible, a burly, homespun, big-hearted, crackerbarrel individualist who was equally popular and respected at ranch barbecue, civic club luncheon, and ivy-league tea party.

Showered with tributes, honorary degrees, medals, plaques, and citations, glorified by the professions, honored as no agricultural leader had even before been honored, Big Hugh retained his poise and perspective. He never lost faith in science on the one hand, or people on the other. He was always accessible, an eager welcomer of ideas. He kept the doors open to his office and his mind. His brand of research was humanized, uninhibited, imbued with his own heart, understanding, fluency, and courage. He had little patience with a science that was too smug, timid, or lazy to move boldly out to the service of humanity.

Hugh Bennett lives today in the land he succeeded and reinvigorated, and in the Soil Conservation Service which was his chosen instrument. We see him in the contoured landscape. He is in the song of mountain stream, the call of duck and quail, the rustle of wind in corner woodlot. He is in the hum of harvester, and in the lighted faces of country people. That is the way it will always be, for The Chief left this Nation the legacy of a stewardship that is for tomorrow and tomorrow and tomorrow.

—WELLINGTON BRINK

Note:—Wellington Brink is the author of "Big Hugh," the principal biography of H. H. Bennett. Mr. Brink was an information specialist and editor for the Soil Conservation Service for 20 years, until he left the Service in 1955. At present he is a contract writer and editor in Dallas, Tex.

What Others Say About Hugh Hammond Bennett

"Great men usually are memorialized in stone or metal, but the earth itself is being carved into a memorial to Hugh Bennett."

Milwaukee Journal

"A sand fence in the Texas panhandle, a well-turned terrace in the Midwest, a row of trees in the South . . . remain, for Big Hugh Bennett, prideful memorials."

Charlotte Observer

"What Hugh Bennett taught us was that in our ignorance and blindness and almost in secrecy, the treasure of our lands and our lives can slip from beneath us—and suddenly be gone forever."

Raleigh News and Observer

"Few men have made any greater contribution to the economy of the Nation and the world than Dr. Hugh Hammond Bennett, former Chief of the U.S. Soil Conservation Service."

Mobile Press-Register

"In his lifetime, Bennett wore the mantle of greatness. He combined knowledge and vision with remarkable feats of persuasion. He was responsible, as nearly as one man can be, for changing the attitude of the Nation from indifference to active concern for its soil. He added 'topsoil' to the layman's vocabulary. He called it a priceless, irreplaceable heritage and made it stick."

WILLIAM E. RICHARDS

"Hugh H. Bennett had the good fortune to be acknowledged as a prophet in his own country and in his own time . . .

" . . . His life work was not only in demonstrating the virtues of conservation, but also in demonstrating the rich rewards to be had in dedicated public service."

Washington Post

"In the field of soil conservation—and especially in the work of erosion control—Big Hugh knew what he was talking about, and . . . no representative of special interests could deter him in his dedication to the task of saving the soil so that it could be put to proper and productive use."

Daily Plainsman

"Future generations of Americans will have reason to be grateful to Dr. Hugh H. Bennett."

St. Louis Post-Dispatch

"Although much emphasis has been put on the simple, down-to-earth traits in Hugh Bennett's approach, any reporter of this man and his works must make one point unmistakably clear: that his bigness—of stature and mind—enabled him to move comfortably in any situation that confronted him. He was as much at home buying country butter at a crossroads store as he was selling soil conservation to a Princeton University assembly."

SANTFORD MARTIN

"Three volumes would be insufficient to tell in detail what Dr. Bennett has done during the last half century for his country and for the world. It is no exaggeration to say that this 'father of soil conservation' stands among the nation's most useful citizens."

New York Times

"Dr. Hugh Hammond Bennett was one of our great scientists, one of our great agriculturalists, one of our great crusaders. His vision, his knowledge, and his determination helped establish, within our lifetime, a national awareness of the urgency of protecting the soil as an essential but perishable natural resource. He was a man who knew and loved the land, but who loved mankind more."

EZRA TAFT BENSON

"Hugh Bennett was a man with a single purpose. He pursued that purpose tirelessly and relentlessly all of his life. For nearly half a century he carried on a militant crusade against soil erosion and on behalf of an action program to protect and improve the nation's soil and water resources."

"More than any man, he was responsible for our national soil and water conservation and watershed protection programs that extend into virtually every corner of the United States, and for the development of similar programs in some 48 other countries."

DONALD A. WILLIAMS

Cranberry Production in the Pacific Northwest

By Earl R. Baker

FOUR years of hard labor, with an investment of around \$3,500 an acre, are necessary before the first crop of berries is harvested from cranberry bogs in the Grays Harbor Soil Conservation District of western Washington.

This highly specialized crop is restricted to a small area in Pacific and Grays Harbor Counties, stretching along the beaches for nearly seven miles. This area produces 75 percent of Washington's cranberries.

The cranberry industry of this area started six years before Washington became a State, when Robert Chabot decided to try growing cranberries at Long Beach in 1883. He later moved to North Beach and started the first bog in that area in 1894. The original Chabot bog was reclaimed in 1934, and is still operating.

Drainage always has been a big problem in the cranberry bogs; so in 1900 the cranberry growers organized Pacific County Drainage District No. 1. Other growers noted the benefits of improved drainage. Fifteen years later Grays Harbor Drainage District No. 1 was organized to provide a main drainage ditch to the bay.

Although it now is the largest of the growing areas, the Grayland region was the last to begin. Ed Benn bought 160 acres at Grayland in 1912 for \$5 an acre, later planting 3 acres to cranberries. The real founders of the Grayland cranberry industry, however, were seven Finnish settlers who pur-

chased cranberry tracts in 1913-14. These early pioneers in the cranberry industry were: the Nyman Bros., John Jeikkila, John Lundgren, Arthur Raunanen, Henry Hanna, and Herman Joutsen.

Although this was the beginning of a great industry on the Washington coast, there were many problems and hardships to overcome through the years. John Niemi, an oldtimer in the Grayland area, says, "Many a time we lived on spuds, clams, and swamp water to get by."

Costs of clearing land were high. Work was done by hand labor, which was extremely time consuming. Modern equipment and methods of weed and insect control were not known. It cost from \$750 to \$1,000 an acre to clean up a weedy bog before World War II. As production problems were solved and new markets developed, more land was purchased and brought into production. Acreages increased until at present there are 178 growers raising cranberries on 550 acres of the highest producing bogs in the United States. Most of these growers are cooperators with their soil conservation district and receive technical aid from SCS technicians assigned to the district.

Following the selection of a desirable site for a bog, it is cleared of all trees, brush, roots, and sedges before it can be leveled and prepared for planting. As the clearing and leveling progress it is necessary to lay out and install a complete system of drainage ditches. These ditches serve a dual purpose of protecting the bogs from flooding during heavy rains and controlling the water table. An excess of water is injurious to the cranberry plants

and excessive drainage causes a decomposition of the peat, which results in settling of a bog.

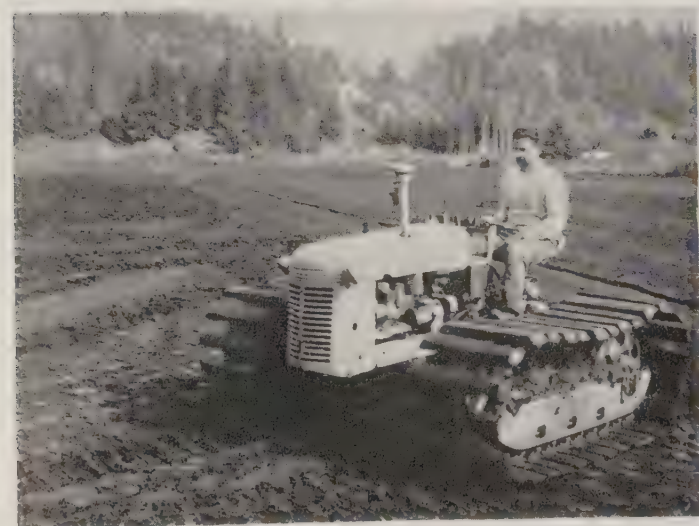
During the period following installation of the drainage system, most growers contact SCS engineers to design and lay out a sprinkler irrigation system. At that time a complete conservation plan is written for the entire farm. Water storage permits from the State are obtained to give the grower permission to store and use irrigation water.

The cranberry grower has a multipurpose use for his irrigation system. Water is stored in reservoirs and pumped over the entire bog through an overhead sprinkler system. This is done during dry weather and also during periods of extreme heat when the growing berries may become injured by heat scald.

A more important use of the sprinkler system, however, is for protection from frost during early spring and late fall. The system is controlled thermostatically to turn on immediately as the temperature over the bog dips to 32 degrees. The fine spray over the vines prevents injury to the cranberries, even with temperatures as low as 24 degrees. This type of irrigation system may cost as much as \$1,000 per acre.

Following installation of the irrigation system, the field is prepared for planting. A small movable railroad track is laid the entire length of the bog to transport sand. The track is later installed permanently down the center of the bog. It is then used for spray equipment, resanding operations, and fertilizing and transporting the harvested crop to the warehouse.

Note:—The author is work unit conservationist, Soil Conservation Service, Montesano, Wash.



Pictures: (upper left) Clearing and scalping a cranberry bog on the Martin Paulson farm, near Grayland, Wash. (left center) Martin Paulson digging drainage ditch on his cleared bog. (lower left) Martin Paulson leveling the bog after drainage ditches were installed. (upper right) Cliff Marrs and Martin Paulson leveling the bog after drainage ditches were installed. (right center) John Marrs spreading sand over their leveled bog, near Grayland, Wash. (right center) John Marrs planting cranberry vine cuttings on the bog, after sanding operations are completed. (lower right) Frank Echols of Grayland, Wash., harvesting cranberries with a Western picker.

During the slack seasons of early winter and spring the bog is thoroughly leveled. A layer of sand from three-quarters to one and one-half inches deep is applied. The uniform sand layer stimulates root growth of the plants. Cuttings of vines, obtained from local producing bogs, are then planted directly into the sand. Some machine planting has been done with homemade equipment. But R. J. Bailey, a local grower and supervisor of the Grays Harbor Soil Conservation District, says that four-fifths of the cranberry bogs in the area have been planted by hand.

Following planting of the bog, there is a four- to five-year waiting period before the first crop is ready for harvest. During this period of slow plant growth and after production begins, there are continuous problems of management confronting the grower. Good management includes such practices as fertilization, weed control, pruning of vines, frost and heat control, insect and disease control, irrigation, and crop harvest. The suc-

cess of these practices largely determines the life of a bog and its production over the years. A bog under good management may last a hundred years or more.

Methods of harvest have advanced considerably over the years. Originally, harvesting was done by hand or with a hand scoop. As labor became a problem, the suction picker was developed. This machine is essentially a vacuum picker that plucks the berries from the vines by suction. Mechanical pickers have been developed recently that enable one man to pick as much as one-half acre per day. A combination of all three systems is now being used on many of the bogs.

As the crop is harvested the cranberries are transported on small flat cars over the railroad track to the warehouse near the homesite. Here the berries are cleaned, sorted, and placed in containers to await transport by truck to the local cannery for processing.

Over the years, through improvements in equipment and manage-

ment, great strides in production have been made. The area under the management of one grower has increased from one or two acres in the early days to as high as 14 acres in some locations. Yields range from 75 to 300 barrels per acre. A barrel of cranberries weighs 100 pounds and sells for \$12 to \$13. Immediately after World War II, the price per barrel jumped to an all-time high of \$32 a barrel.

All cranberries from this area were sold on the fresh market until 1941, when the growers in the Grayland area built their own cannery and processing plant at Markham. The Markham plant processes all the berries grown in Washington, as well as those grown at Clatsop, Oregon. The plant packages and distributes fresh berries, cranberry sauce, and a recently developed juice that is becoming a favorite refreshment in many places. At the peak of operations the output of processed cranberries at this plant exceeds 215,000 cans and 65,000 pounds of fresh berries per day.

LAND IMPROVEMENT THROUGH BRUSH CONTROL

By Harry M. Elwell

MILLIONS of acres of land produce little of value because scrubby, woody vegetation prevents the growth of desirable grasses, legumes, or trees. Scientists are rapidly developing methods for conversion of brush lands to greater production through new and more efficient control methods.

Cooperative investigations have been conducted during the last 25 years by brush-control researchers

of the Department of Agriculture and the Oklahoma Agricultural Experiment Station. Similar studies have been made in other States.

Investigators agree that site consideration is highly important in determining whether brushland can be profitably treated. The best methods for eliminating brush vary greatly because of the wide range of woody plants and grasses and the differences in climate and soil.

Before treating brush-infested land, the fertility level, depth, and

erodibility of soil should be determined. Special precautions are

No. 58

This is the fifty-eighth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

Note:—The author is research agronomist, Agricultural Research Service and Oklahoma State University, Stillwater, Oklahoma.



This native grass pasture was covered with a dense stand of brush, similar to that seen in the background, before the brush was eliminated by spraying and clearing.

necessary during removal of brush from soils extremely low in fertility and readily subject to wind or water erosion.

Deep soil that can be cultivated after the brush is removed may be advantageously cleared by mechanical methods. Disk plowing the soil in the spring and fall for about 3 years will usually eliminate sprout growth. After the regrowth has been suppressed desirable grasses and legumes may be successfully introduced.

On the deep soil sites where timber production or growing of pecan or other nut-bearing trees is profitable, the weed-trees and brush species may be eliminated by hand cutting and treating of stumps with herbicides or by basal bark or injector treatments with 2,4,5-T.

In Oklahoma and other nearby States good control of post, black-jack, and dwarf chinquapin oaks and scrub hickory has been obtained from aerial spraying during active foliar growth (May 15 to July 15) with low-volatile esters of 2,4,5-T.

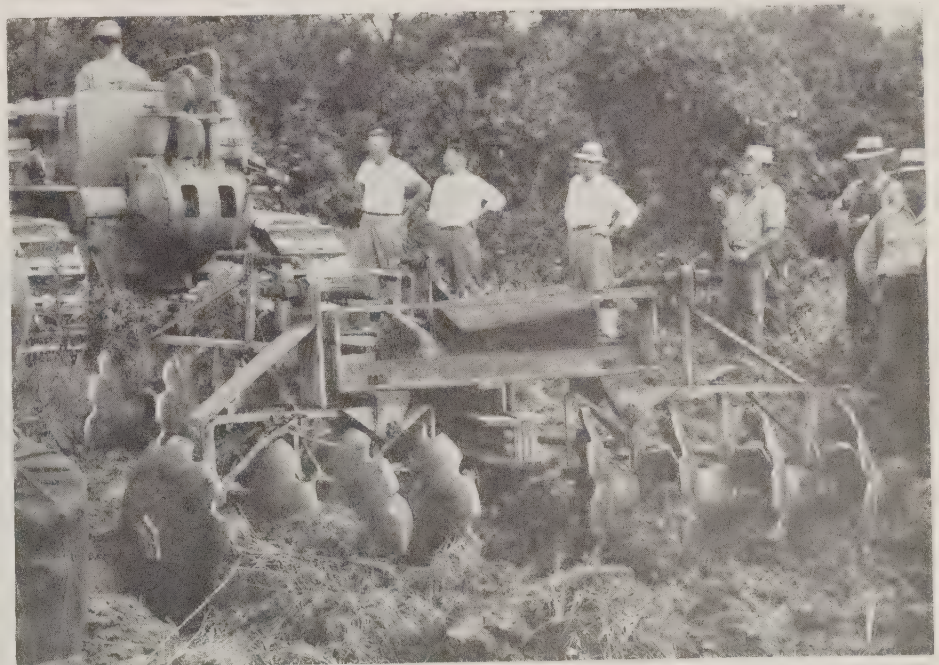
Three herbicide applications were necessary for kills approaching 100 percent of the oaks and hickory. The amount of low-vola-

tile 2,4,5-T ester for maximum kill has usually been 2 pounds of acid in 5 gallons of emulsion spray per acre for a first spraying with another 2 pounds 1 or 2 years later followed with 1 pound as a third application. Two aerial sprayings generally give 60-to-80 percent brush kill and permit good grass recovery.

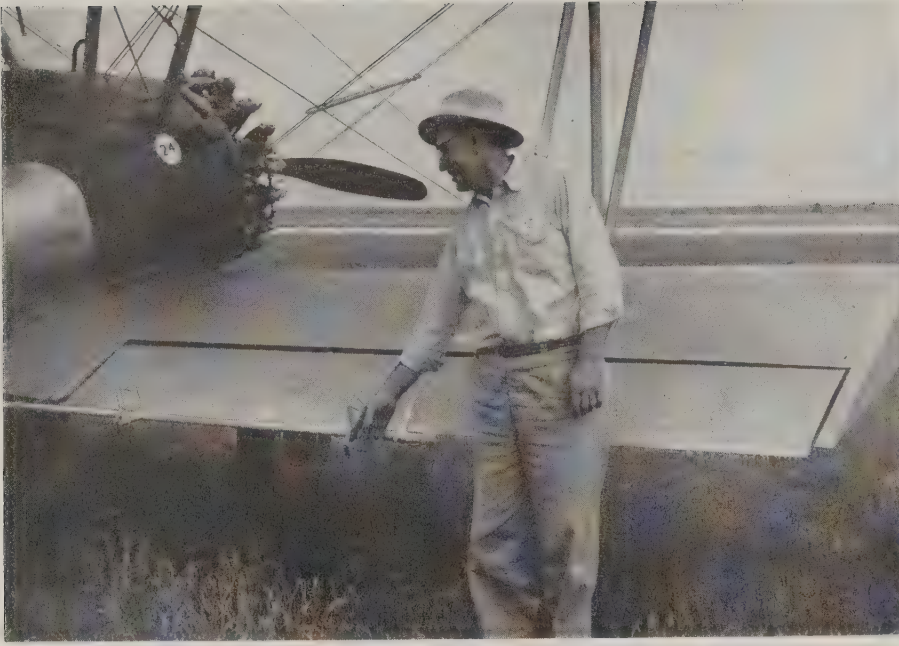
Brush control has resulted in

production of 2 to 5 times as much native grass as on untreated areas and the treated areas have remained free of woody-plant reinvasion for 6 to 8 years. It appears that such areas will not need control measures for several more years if good grazing practices are maintained.

Shinnery oak and mesquite can be effectively controlled with aerial



Disking cleared land with deep soil to kill sprouts and permit establishment of grass.



This type of wing-tip boom with 7 nozzles mounted on a light airplane delivers about 5 gallons of herbicidal spray per acre in a 40-foot swath.

applications of low-volatile esters of 2,4,5-T. These species are satisfactorily suppressed with $\frac{1}{2}$ pound of 2,4,5-T per acre. Retreatments of mesquite are usually required every 6 to 8 years. Shinnery oak usually needs 3 consecutive annual spray applications for maximum kills.

Elm, hawthorn, ash, mulberry, buck brush, and green briar have been resistant to 2,4,5-T in aerial spray applications. These species have been effectively controlled by ground treatments with 2,4,5-T. Buck brush and sumac have been effectively suppressed with applications of low-volatile and high-volatile esters of 2,4-D. As they approach full leaf, these species should be treated with 1 pound of 2,4-D acid per acre. Annual retreatments for several years have sometimes been necessary to eliminate buck brush.

Persimmon generally is not killed with 2,4,5-T aerial sprays, but it may be defoliated with 2,4,5-T or 2,4-D. On persimmon, 1 pound of acid of 2,4,5-T ester per acre applied as a ground spray has produced fair control. Two or three

annual retreatments with the same amount of herbicide will usually give satisfactory control.

Drenching the foliage with herbicidal sprays applied from the ground has been effective in eliminating many non-commercial hardwood brush and tree species. For this type of treatment 2 to 4 pounds of low-volatile ester 2,4,5-T has been required to obtain good con-

trol. Annual retreatments often have been necessary to eliminate all the unwanted brush and trees.

Basal bark and stump applications, injections, and soil treatment have given effective killing of single plants of most hardwood species. Many brush plants not susceptible to foliage sprays may be killed with basal bark, injections, or soil applications.

Basal bark applications are made by mixing the esters of 2,4,5-T at 12 to 16 pounds of acid (3 to 4 gallons of herbicide) with 100 gallons of diesel oil or kerosene. This mixture should be applied to wet the lower 10 to 12 inches of the bark of each stem. The application should encircle the plant with some rundown of spray on the bark below the soil surface to control the dormant buds usually located just below the surface of the soil. These treatments have been most effective on plants less than 5 inches in diameter. Larger plants should be frilled with an ax before being treated. The ax incisions should be made to permit the herbicide-oil mixture to penetrate into the inner bark of the tree.

An injector has been an efficient tool for placing esters of 2,4,5-T—40 pounds (10 gallons) of acid



Applying foliar spray of 2,4,5-T ester to brush with a powered ground sprayer.



Equipment and methods used in basal bark and injection applications of 2,4,5-T ester mixed with diesel oil.

mixed with 90 gallons of diesel oil—in the inner bark of trees. The injections for most of the woody species should be spaced 1 inch apart and encircle the plant. Injections made near the soil line permit the herbicide to be readily carried into the root system.

Basal bark and injection treatments have given satisfactory control when made throughout the year. But applications during the winter, when plants are dormant, are often preferred.

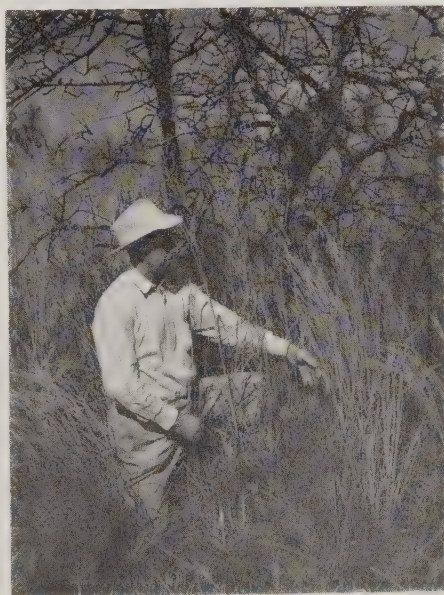
Sprouts on stumps have been prevented by applying sixteen pounds (4 gallons) of 2,4,5-T ester in 96 gallons of diesel oil or kerosene immediately after cutting. The edge of the cut and the bark on the stump to the soil-line need thorough treatment. Some rundown of spray on the bark below the soil surface is advisable.

Soil treatments have been made with monuron (3-(*p*-chlorophenyl)-1, 1-dimethylurea) and fenuron (3-phenyl-1, 1-dimethylurea) 80 percent wettable powder by mixing $\frac{1}{8}$ to $\frac{1}{4}$ pound to 1 gallon of water and applying a band 6 inches wide on the soil around each plant. Pellets of these materials, at 25 percent concentration, have also been used. Fenuron has been most readily active on the majority of the woody

species. Most of the oak species are affected with rates as low as 6 pounds of active chemical per acre. Higher rates give more consistently good results under variable soil and climatic conditions.

Monuron and fenuron are more effective on plants growing in sandy soils than on those in clay or clay loam soils.

Elms and persimmon have been killed with monuron and fenuron; they usually do not die, however,



A lush stand of native grasses that developed in 2 years after brush was sprayed with 2,4,5-T ester.

until the second year after being treated.

The 2,4,-D and 2,4,5-T formulations are relatively low in toxicity to soil, man, animal, and most of the grasses. If not properly applied (particularly aerially) 2,4-D and 2,4,5-T may drift or float in air currents, and move from the area of application to adjacent areas and affect desirable field-crops or woody plants. However, they have been safely used for several years on pasture and range lands. Better ways are being developed for greater safety in their application.

Monuron and fenuron will often temporarily suppress native grasses, cause slight soil sterility, and are toxic to many of the desirable woody plants. Care should be taken not to apply these materials where they will be carried in runoff or irrigation water.

Management practices such as fire protection and deferred grazing have been valuable aids in establishing desirable vegetation on brush-infested areas that have been treated with chemicals. Areas that have been accidentally burned 1 and 2 years after being treated have had more root sprouts than unburned areas. Litter on unburned areas reduces wind and water erosion while the grasses are becoming established. The oaks and hickory plants dying from the effects of 2,4,5-T usually fall in small segments; thus there is very little possibility of injury to grazing livestock.

Deferred grazing on native rangelands from May 1 to October 15 for two seasons following application of 2,4,5-T has permitted the native grasses to develop an excellent sod, good forage production, and fair seed yields.



Of the 90 new crop varieties released cooperatively by the U.S. Department of Agriculture and State experiment stations last year, more than half were developed with specific disease resistance in mind.

The



FROM the deserted mining camps high in the Rockies the shades of the bewhiskered oldtimers, who lived, dug, fought, and died there during the gold rush days must have looked down transfixed at what they saw. The magic that was taking place on the plain below the foothills overshadowed by far the fabled tent cities they had watched spring into being a century ago around Poverty Gulch and Leadville.



Pictures: (uper left) Soil Conservationist Ellis Lund explains wind erosion control to Scout audience. (left center) The author joins a Scout audience as range conservationist Raymond Thompson explains the life zones determined by climate and altitude. (lower left) Soil scientist Orville A. Parsons explains watershed exhibit to members of the Boy Scout Conservation Committee. From left: the author; Lou Klewer of Toledo; Walter Scherer of Ottawa, Ill.; Ted Pettit, Scout Conservation Director; Jack Culbreath of Washington, D. C.; and Ross Kreamer of Danville, Ky. (lower center) The Avenue of Flags with a huge cake that symbolizes the 50th birthday of the Scout movement in America. (lower right) Part of the camp area for the Scout Jamboree.



Conservation Bivouac — Fifth Boy Scout Jamboree

By Donald A. Williams

You would have to see personally what was happening—as I did—to get an inkling of the magnitude of it.

The fifth Boy Scout Jamboree, in the shadow of Pikes Peak north of Colorado Springs, was by all counts the largest of all the Jamborees, held usually each fourth year. (This year's Jamboree came after a three-year interval to coincide with Scouting's 50th birthday.) In pure statistics, the idea of 56,000 youngsters, in khaki shorts and knee socks, milling about the 2,300-acre tract may not be as impressive as the fact that their campfires took 20 carloads of charcoal and the milk they drank was equal to the daily production from 7,550 cows.

It took 70 special trains, 28 regularly scheduled trains, and untallied hundreds of buses and chartered planes to get them there.

The site was a broad expanse of conservation rangeland almost directly across Fountain Valley from

the new Air Force Academy. It was a part of the R. E. Johnson ranch, with gently sloping hills and real evidence of conservation stewardship over a quarter-century.

Downslope from the 30-acre area devoted to soil, water, plant, and wildlife conservation exhibits and demonstrations were a clear, deep ranch pond, a small area developed for wildlife and, just above, a good example of erosion control work. The work on this ranch was a part of the earliest in soil and water conservation done in Colorado, on the Black Squirrel Demonstration Project.

During all of the 25 years since elapsed, the rancher had been a dedicated steward of the soil. He had missed no opportunity to repair evidence of erosion or overuse of his lands and to give his range a chance to recover its native vigor.

Along with his interest in range conservation there had been a sincere desire to contribute personally to the needs and interests of his fellow man. His ranch has been available for many years for just

such use as the Boy Scouts of America have made it. Few of the Scouts knew that the kindly rancher whose generosity had contributed to their Jamboree adventure died on the Monday of their Jamboree.

A good measure of credit for the achievement in getting the big site ready for the Jamboree must go to the joint efforts of our own forces of the Soil Conservation Service on State, area, and local staffs and to the boards of the Fountain Valley and the Central Colorado Soil Conservation Districts. You don't prepare for an event of this size in a month or two. In the fall of 1958, when it was known the Jamboree would be on this site, the Boy Scouts Jamboree Committee came to the SCS Colorado Springs staff and asked what might be done about building an amphitheater and grassing it.

Supervisors of the Fountain Valley district and SCS technicians looked over the 2,000-acre campsite and decided on a spot. The first step, after the site had been sur-

The author is Administrator, Soil Conservation Service. He is a member of the conservation committee of the Boy Scouts of America and a member of the Scouts' National Council.



veyed, was the shaping and grading of the 15-acre layout. El Paso County officials helped with equipment. The machines moved over 50,000 cubic yards of earth.

The district agreed to see to the job of grassing the slope, to the irrigation and the mowing. The snowy, rainy spring of 1959 delayed seeding, but by mid-May it was done, with bromegrass and perennial rye. Explorer Scouts of Colorado Springs pitched in by scattering hay to serve as mulch. (They used their earnings to help buy uniforms.)

It took a lot of irrigation to bring the grass stand through that dry and windy summer.

Bob Ermel, vice president of the Fountain Valley Soil Conservation District, took on much of the responsibility for the grassing work.

By Jamboree time the grassy green slope, with the stage below, was all that the officials and their 56,000 charges could desire.

One of the valued impressions that the young visitors have taken home with them undoubtedly has been that of the conservation story they heard on the hill overlooking the vast encampment. Here they visited, troop after troop, the exhibits and demonstrations where men of the Soil Conservation Serv-



A do-it-yourself demonstration where Scouts learn about soil testing.

ice, Forest Service, Public Health Service, Bureau of Land Management, Weather Bureau, Geological Survey, and many Colorado State agencies explained how soil, water, forests, range, and wildlife all figured in their lives. The young listeners heard of the mysteries of the weather cycles, the importance of watersheds, and the relationships of sun, air, soil, and water to all living things.

To stand near while Soil Conservationist Joe Trierweiler of Buffalo, Wyo., Soil Scientist Dick Henderson of Littleton, Colo., Woodland Conservationist Ewing McClain of Raton, N. Mex., or Soil Conservationist Robert Richter of Holdrege,

Nebr., recited their portions of the story of soil and water conservation gave me a renewed feeling of pride in our technical forces.

It was a delight to watch the rapt expressions of the Scouts as they sat in fan formation around the shelters. The talks and demonstrations were timed for 9-minute periods. You could tell the youngsters would have liked three times that interval at most of the stops. It was evident that the simplest of the demonstrations, too—the falling of water on soil or cover, the movement of water over miniature fields, the action of wind on loose soil or protected areas—were the lessons that seemed to make deep impressions on the young audiences.

Day after day, beginning with Wednesday, July 20, the columns kept coming, to see, hear, examine and reflect on the story told in words, photographs, and actions. It was regrettable that it was impossible for the entire encampment to have a chance to visit the conservation area.

It was stimulating to stop by the exhibits and demonstrations of our brother agencies, to see and hear their representatives give other chapters in the story of the outdoors. Especially impressive was the miniature mountain built by the Colorado Department of Game and Fish, depicting the effect of summer and winter conditions on wildlife.

And now and then along the way, a uniformed Scouter—at home an SCS technician—would come up to shake my hand. It would be interesting to know how many of our field forces are active in the Boy Scouts of America, helping to shape American character through the thousands of troops and cub dens over the country.

For example, Orville Parsons of Lamar, Colorado, another of our demonstration crew at the Jamboree, has given over 20 years of



Orville Parsons discusses soil and water conservation with a group of Scouts from Pennsylvania.

service to Scouting for which he holds a handful of awards, including the coveted "Silver Beaver."

This kind of service is one of the extracurricular phases of our work in which we can take a great deal of pride.

There are many others in our Service ranks who deserve a salute for their part in the Jamboree. There are Delbert Hanson of Randolph, Utah, and from Colorado bases, Raymond Thompson of Las Animas, Ellis Lund of Golden. And there are Clem Dodson of the State

staff in Denver and Area Conservationist Dearl Beach at Colorado Springs.

Cashar Evans of Selbyville, Del., chairman of the youth committee of the National Association of Soil Conservation Districts, gave stout support to the soil and water conservation effort. In Scout uniform, he helped direct the visiting troops at the conservation entrance.

And a special word of thanks is in order for a veteran scout leader, Dr. Gerald M. Richmond, of the U. S. Geological Survey in Denver,

who helped train 80 Denver Explorer Scouts to help with the conservation area at the Jamboree.

This was the third Jamboree in which the conservation of our soil and water resources was sharply accented. The emphasis in this one was the heaviest. The leaders of Boy Scouts of America are to be congratulated for their recognition of this opportunity to reach this portion of our youth with a story which will be vastly more important by the time five more Jamborees have passed.

A Look At the Future for Scout Conservation Activities

By Irving J. Feist

WE all know that any Scouting conservation program is effective only to the extent that it reaches the boys—3½ million of them—who are registered in Scouting. For several years, the National Committee on Conservation of the Boy Scouts of America has been developing a program for Scout councils aimed in this direction. We have been actively promoting this program now for more than a year—and in those forty or so Scout councils with whom we have worked directly and personally, the program seems to be effective.

One of our major objectives for the future is to "sell" the following four-point program to each of the 540 councils in America: (1) Each council have a professional conservationist in a key volunteer position, to serve as advisor to the council on conservation programming and promotion; (2) each council have a long-range land use pro-

gram for each acre of land it owns, and a written schedule for carrying out that plan; (3) each council have a carefully planned program of conservation activities for boys in camp, with a qualified staff man to direct that program; (4) each council develop a year-round pro-

gram of conservation activities for all boys to work on in their home communities, with adequate trained leadership to guide these activities.

Another major project in the next few years will be the search for a better way of teaching conservation fundamentals to boys who



SCS technician explains the meaning of topsoil to a group of Scouts.

Note:—The author is chairman, National Conservation Committee, Boy Scouts of America, New Brunswick, N. J.



Scouts learn about the water cycle at the Philmont Scout Ranch, Cimarron, N. Mex.

live in metropolitan and suburban areas. We know that the bulk of our population lives in these areas, where they are far removed from the land and, in most cases, from actual conservation program opportunities as they are generally understood today. We know that the power of the vote is concentrated in large cities and suburban developments—yet all too many of our citizens have little awareness of resource use and conservation problems. We think we have a tremendous opportunity in citizenship training on conservation in these large population centers.

But we must discover the way to teach conservation to city boys, within the structure of the Scouting program. We have some ideas that we think will work. Our plan is to try them out in some selected areas and to set up some pilot projects. After serious study of the results, we hope to come up with a program of conservation for Scout units and individual boys right where they live—in cities or Levittowns across the country.

A third major point of emphasis is one which some of you readers know about, because you are work-

ing with us on this project. Briefly, it is this:

There are some 400,000 acres of land in Scout camps across the country. Councils are adding acre-

age every day—and some councils are losing their camps at the same time, losing them because they are wearing out.

We know now that recreational use can be just as hard on the land as agriculture or any other use. And all too often some of the same problems occur—sheet erosion, gullying, silted lakes and ponds, etc.

Our objective, with the help of the Soil Conservation Service, the Forest Service, the Bureau of Land Management, and the National Association of Soil Conservation Districts, is to select fifty or so camps from coast to coast and use them as “guinea pigs” in an effort to find out just how to manage a piece of property that is used for camping so that ten, twenty, or fifty years from now that property will have been improved with use and not destroyed. It’s a big job, and an important one, if we hope to continue to have campsites where increasingly large numbers of boys



A scoutmaster explains some of the facts about wildlife conservation to a group of Scouts.



Scouts planting reed canarygrass on the shoreline of a pond near Lincoln, Nebr.

can get away from the city for a week or two each summer, and for several weekends during the year, to enjoy some of the benefits of outdoor living and outdoor education.

Still another major project is the completion of our Conservation Training Center in New Brunswick. We now have under construction on the National Office property in New Brunswick, N. J., a 22-acre nature and conservation demonstration laboratory. The purpose of this activity is the development of an outdoor laboratory or instruction center, where school classes, youth and adult groups, and the public in general may come to see and to learn.

One area of about eight acres will be devoted to fifty or sixty exhibits, demonstrations, and miscellaneous visual aids, all aimed at getting across some of the fundamentals of ecology in terms that anyone can understand. In so doing, we will have instruction centers in geology, climate and weather, soil, water, animal life, and plant life—with the emphasis on the interrelationships of these resources.

The application of ecological principles will be presented in a separate 12-acre conservation sec-

tion, where on-the-ground examples of good conservation practices in soil and water, forestry, and fish and wildlife management are now being installed.

In time, we expect to install exhibits covering marine resources and their management, the use and conservation of mineral and fuel resources, and other phases of the total natural resource and conservation picture.

It is our hope that this project will serve as a pilot model for many Scout camps, and that sooner or later most of the ideas and teaching devices used here will be adapted and modified to fit in similar situations around the country. We've seen the effectiveness of this method of teaching conservation fundamentals—and the popularity of similar projects elsewhere. In this activity we think we can perform a tremendous public service far above our normal conservation education program.

In addition to these continuing activities on conservation, the National Jamboree of the Scouts features conservation every third or fourth year. At the Jubilee Jamboree held in July of this year near Colorado Springs, Colo., the conservation program and exhibits were especially impressive.

There, on about 20 acres, more than a hundred representatives of 22 private, State, and Federal con-

servation groups set up a series of conservation instruction stations designed to teach some of the more important conservation fundamentals to 50,000 or more boys and leaders during the last week of July.

The primary purpose of this activity, of course, was to teach some conservation fundamentals to a large group in a few days, and also dramatize conservation and make it more important in the eyes of boys. But this "spectacular" had another objective too—to set a pattern for a method of conservation education that could be adapted for use on the local level.

During the same period the Jamboree was being held in Colorado, local councils across the country held local Jamborees, most of which featured conservation in one way or another. Two outstanding ones in this respect were New York City and Bangor, Maine. Each of these cities featured conservation in its local programs in much the same way as was done at the National Jamboree. The total audience in New York was at least equal to that of the national event in Colorado.

These are some of the major projects that the Committee on Conservation for the Boy Scouts of America is now pushing. Other ideas and projects will doubtless develop in the future.

5,629 Cooperators

By John C. Beard

CAMP Perry, a 150-acre Boy Scout camp on the banks of the beautiful Arroyo Colorado near Rio Hondo, Texas, has joined the ranks of Cooperators in the Southmost Soil Conservation District.

The warm feeling one gets by helping a single farmer or rancher

to conserve and improve his land was multiplied 5,629 times when the Scouts of the Rio Grande Valley Council developed and began to carry out a conservation plan.

All this happened when Scout officials, who represent the 5,629 Boy Scouts of the Council, signed a cooperative agreement to use the land within its capabilities and to

Note:—The author is work unit conservationist, Soil Conservation Service, San Benito, Tex.

treat it according to its needs for God, Country, and other Scouts yet to come!

Surrounded by thousands of acres of irrigated land, Camp Perry lies in its original state, except for the invasion of native brush which is very common in south Texas. The Boy Scouts have pledged to protect and improve the 150 acres for wildlife and recreation. Since their national theme for 1960 is "Physical Fitness and Conservation," what better project could they have?

During summer camp in 1959 all the Scouts had an opportunity to suggest treatments for wildlife food areas, gully control, brush control, and improvement of native grasses. The boys had a part in developing and recording their conservation plan.

District supervisors of the Southmost Soil Conservation District and Soil Conservation Service technicians are giving all the assistance possible to encourage the Scouts. Little encouragement is needed, however, since the whole plan is



Scouts planting palm trees around the grounds of Camp Perry.

based on their ideas.

Two special food areas 100 feet square are being cleared of brush and planted to blue panicum grass for dove and quail. Brush piles are placed nearby for protection from predatory animals. Devices will be installed to provide water during periods of extended drought. A Scout troop is undertaking this project.

Fire lanes have been cleared around the entire camp and palm

trees planted to add beauty. Over 1,000 palm trees have been planted.

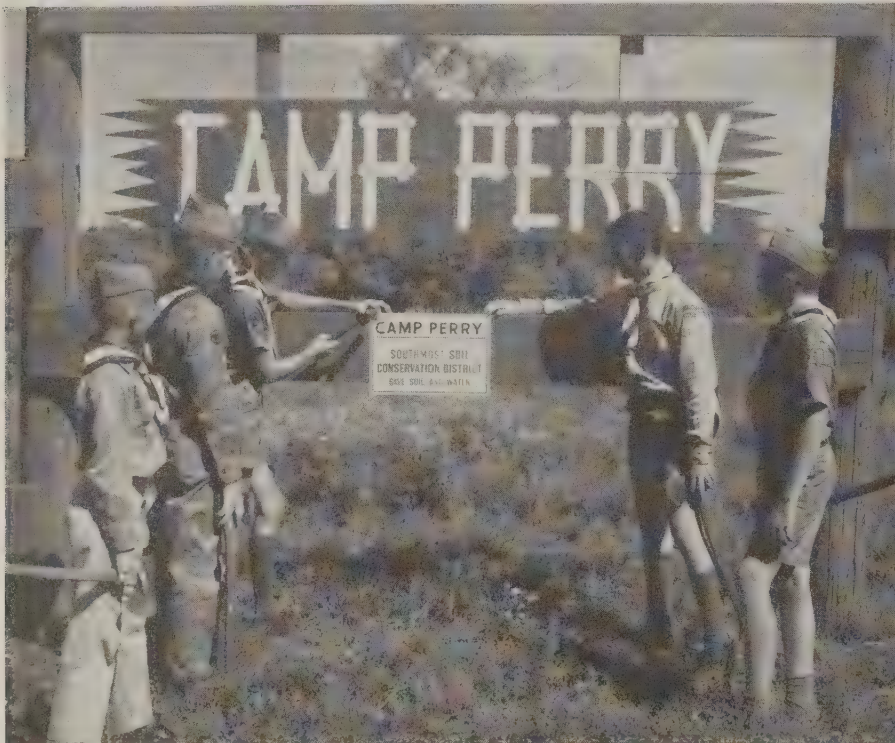
Gullies that began to form along the steep banks of the Arroyo have been planted to grass and other areas having good cover are being protected.

Spoil banks made from dredging a ship channel are planned for wildlife food areas. Areas of thick undesirable brush will be thinned to give more sunlight to more useful plants.

A permanent Conservation Nature Trail is being set up by the Scouts and the soil conservation district supervisors. Signs, identifying plants and other interesting subjects, have been carved in wood and placed along the trail as permanent markers.

During June 1960 over 1,200 Scouts, Scoutmasters, and Leaders enjoyed the new Conservation Nature Trail. Twenty-four different groups were conducted on tours by the district supervisors, assisted by Soil Conservation Service technicians. Everyone attending Camp Perry saw the movies "A Heritage We Guard," "My Country," and "Bob White Through the Year."

There is no doubt that the Boy Scouts know that there's a Soil Conservation District in the Rio Grande Valley and that as a District Cooperator they are planning to do their share to conserve our natural resources.



Scouts are proud to show that their camp is cooperating with the local soil conservation district.

Soil fertility has an effect on the prosperity of wildlife. This relationship is explained by Howard Wieggers, assistant professor of poultry husbandry at the University of Nebraska: "Plants grow in the soil and furnish food and shelter for both wild and domestic animals. It has been learned through experimentation that wild animals living in areas with the most fertile soils have grown heavier, yielded better furs, and even grown stronger bones than those from less fertile soils."

Contractor Plays "Boy At The Dike"

WHEN capricious Atlantic tides threatened success of a southern New Jersey small watershed project, contractor Frank Gaskill may have recalled the legend of the heroic Dutch lad who stuck his finger in the dike and saved his Netherlands village.

At any rate, Gaskill moved swiftly and in classic tradition. As rushing tides began—for the umpteenth time—to tear apart the almost-closed embankment being built to protect Lower Alloways Creek Township, he flung his automobile into the breach. The sedan temporarily plugged the hole while squadrons of earth-movers finished the re-filling job.

Scene of Gaskill's feat is the Silver Lake-Locust Island small watershed project, designed to protect 5,500 acres of farm, community, and wildlife land adjacent to Delaware Bay. The area had been at the mercy of the see-sawing ocean and tidal creeks since hurricanes tore through centuries-old dikes five year ago.

Engineering and land treatment work supervised by Soil Conservation Service specialists was begun early this year.

The dramatic moment came when the contractor's crew tried for 36 hours, around the clock, to plug the wavering 20- to 50-foot gap in the embankment at the precise instant of slack water between tides. By sacrificing his car to the elements, Gaskill slammed the door on the mighty Atlantic.

Pictures: (top) Euclids and bulldozers stockpile fill material while waiting for the tide to slacken so they can close the final gap of the fill. (center) Gaskill has driven his sedan as far out on the fill as he can and is leaving it so that the bulldozer can push it into the gap of the fill. (bottom) The sedan fills the breach as bulldozers rush to cover it with dirt and permanently close the gap in the dike.



Missouri's Little Dust Bowl

By Gaylord H. Wisner

DUNKLIN, like some other counties in southeast Missouri's "Bootheel," at one time had a severe wind erosion problem.

Before 1900 this area was in timber and wildlife was abundant. Intensive logging operations soon converted it to cropland. The balance of nature was upset and for a long period no educational program was in effect to stress proper land use. Soil-depleting crops and the consequent "burning out" of organic matter soon left the sand free to blow.

In an area of such complex econ-

omy, an exploitive type of farming left many undesirable conditions. Sand "blowouts" had not reached the point of abandonment, but large areas suffered disastrous soil losses each winter and spring. Dust darkened the sky. Topsoil drifted into fence rows. Highways and roads were covered. The most damaging result was the movement of sand particles along the surface of the ground at high velocities, causing severe destruction to young growing crops. Homemakers spent half their time dusting and laundering.

Sportsmen soon felt the effect of this miniature "dust bowl."

Note:—The author is work unit conservationist, Soil Conservation Service, Kennett, Missouri.



James Blanton displays organic matter in a cover crop that is being turned under as green manure in Dunklin County.



Sand drift in a fence row on a Dunklin County farm.

Streams ran muddy and overflowed frequently while wildlife began to look for new homes. Big game, such as bear and deer, were the first to go; but for a short time small game and songbirds held their own. Then their good habitat began to disappear and in the winter ground cover was nonexistent.

Thinking people decided it was time for an "about face" and began to work toward a planned program of better land use.

In March 1949 Dunklin County farmers organized their soil conservation district. One of their first objectives was to encourage the use of cropping practices aimed at halting the perennial wind erosion hazard.

The district supervisors counseled with the Soil Conservation Service, the Extension Service, and other agricultural agencies as to the best approach. A known fact came to the mind of all concerned—that vegetation is a healer of nature and a nearly perfect soil conservation practice. They stressed the importance of seeding more and better winter cover and green manure crops, using a mixture of 20 pounds of hairy vetch and one bushel of rye per acre. This gave the answer and has proven to be the "back-

bone" of our agricultural economy on sand-blow areas.

The rapid expansion of cover-cropping led to the widespread introduction of "windstrip" farming—the planting of a field in alternate strips of conventional row crops such as cotton, soybeans, or corn, while leaving a strip of cover crop between each intertilled crop. The width of the wind strips and intertilled strips depends on the degree of hazard—some soils are more vulnerable to wind erosion than others. Usually the intertilled strip is thirty rows wide and the wind strip 14 feet. After the crops on the wind strip mature they are harvested for seed. Strips laid out at right angles to the prevailing winds, usually from the southwest, are most effective.

For wildlife-conscious district cooperators, windstrip farming has provided ideal nesting sites for quail, songbirds, and other ground-nesting birds and excellent habitat for rabbits. The Missouri Conservation Commission has heartily endorsed this practice by publishing a feature article about it in their monthly magazine.

When sprinkler irrigation came along, farmers spaced and centered the windstrips to string sprinkler laterals. Some used these strips as lanes to operate a tractor to lay pipe.

The seeding of cover-green manure crops and strip farming seem to be here to stay as attested, since they are becoming more popular

each year. Of the 200,000 acres once having a wind erosion problem in Dunklin County, 143,500 acres are now being stabilized annually through the use of windstrip cropping. In addition to being a soil builder through addition of nitrogen and organic matter, its chief function is mechanical protection of the soil and young tender plants from the abrasive action of blowing sand.

An educational program was set up in 1950 to bring the largest number of farmers into a planned action program as quickly as possible. The Kennett Chamber of Commerce, in cooperation with Radio Station KBOA and local newspapers, initiated a weekly "Man On The Farm" radio information program. This program is directed at farm people and emphasizes the windstrip cropping program of the district.

Soviet Hog Farm Nearly Buried by Dust Storm

Here's the way the Russian newspaper *Izvestiya* describes a dust storm at the Iskra hog farm in the Krasnodar area of U.S.S.R.

—Editor

A "black storm" obliterated the sun, choked off human breath, and caused the farm to become an island in a raging ocean of dust. Buildings were buried to their roofs. In the inner yard, the outlet for the water supply was covered, and part of a pond on the land was absorbed. Inside the buildings, hogs became buried, while sand on the roofs threatened their collapse.

The farm's 17 workers—most of them women—took the storm in stride, however, working around the clock to prevent loss of precious livestock. Keeping the water flowing was the first and most urgent job. At one point all 17 manned shovels in the nearly hopeless task of freeing the spigot of dust and debris. At last a tarpaulin was used to shield two men who scooped up

bucketsful of dust and hoisted them on ropes up over the roof.

Meanwhile, women hog-tenders climbed through barn windows and worked to the point of exhaustion digging out the hogs. When the need for additional water became great, they brought it from the pond in buckets, despite the fact that the drifting dust had created a miry shoreline into which they were drawn until they were covered with doughlike mud. Still they managed to bring back 325 pails of water for the farm's 650 hogs.

Then, at the height of the storm and in the middle of the night, some of the hogs started farrowing. All 17 workers were mustered to duty to dig open a barn window, remove its frame, and haul the hogs and their litters through it to safer quarters. Finally, even these quarters became unsafe because of the weight of the sand on their roofs. The already-exhausted hands went to work to clear the roofs. The strong wind kept blowing them off, but they persistently climbed back to continue the attack. At last, as though subdued by the strength of man, the wind died and the sun shone; the 17 workers viewed the clearing skies with dust-reddened but happy eyes.

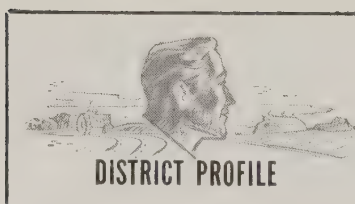
Herbicides Control Weeds In Windbreaks

Studies at the Box Butte Experiment Station, Alliance, Nebr., indicate that three herbicides—karmex, simazine, and atrazine—will control weeds in windbreak plantings without injuring trees. The chemicals were applied in May 1959 and are still giving 100 percent control of weeds in the second growing season.

Karmex and simazine were applied at the rate of 4 pounds per acre, and atrazine at the rate of 2 pounds per acre. All three chemicals were applied with a pressure-type 3-gallon sprayer, in a band 4 feet wide down the tree row. The test plots included cedar and ponderosa pine trees ranging in age from 1 to 4 years.



Wind stripcropping pattern now commonly seen in Dunklin County.



F. S. Hurd of Oklahoma

F. S. HURD, frequently referred to in Oklahoma as "The Grand Old Man of Conservation," has long been a leader for conservation in these parts. After 22 years as chairman of the board of supervisors of the Arkansas-Verdigris SCD and at the age of 93, Mr. Hurd is still active and enthusiastic. His courage and willingness to venture into and support something new has been one of his outstanding traits.

In 1902, at the age of 35, Hurd decided to take all his assets and enter the banking business in the territory later to become Oklahoma. After visiting eight or ten older towns in Indian Territory, he decided he would cast his lot with a new town then being organized on the prairie about 20 miles southeast of the thriving village of Tulsa. One month after the first lot had been sold in the new townsite of Broken Arrow, F. S. Hurd bought two lots where the First National Bank now stands and six lots where his home is.

With no railroad or post office, but an abundance of grass and fertile soil stretching toward the Arkansas River to the south and west and the Verdigris River to the north and east, Hurd saw visions of a prosperous agricultural community.

A month later, he returned from Kansas City with a safe which he hauled cross-country from the nearest railroad at Catoosa. He placed it in the corner of a newly built frame real estate office and hung out his shingle. At first, he slept in his "bank" with a pistol under his head until a more secure place could be built.

In 1904, Indian land began to be sold and the white settlers began

to plant corn, cotton, and other tilled crops in the area. Broken Arrow grew to be a prosperous agricultural community based on the high yields produced from the accumulated fertility of the newly turned sod. High yields, clean tillage, and straight-row methods of farming soon began to take their toll of soil on the slopes of this rolling prairie land.

By 1927 it had become evident to all who would look that something needed to be done. F. S. Hurd began talking with farmers, meeting with Vocational Agriculture instructors, and doing anything he could to encourage better farming methods.

In 1934 the Broken Arrow Soil Conservation Association was organized by Mr. Hurd and other community leaders and it persuaded the U.S. Soil Erosion Service to place a CCC camp in the area.

When Oklahoma passed a soil conservation district law in 1937, Hurd and his fellow workers were ready. In 1938, the Arkansas-

Verdigris SCD was the first district activated in Oklahoma. At the age of 71, Mr. Hurd became the first chairman of the district board of supervisors, a position which he held continuously for 22 years until his retirement in March 1960.

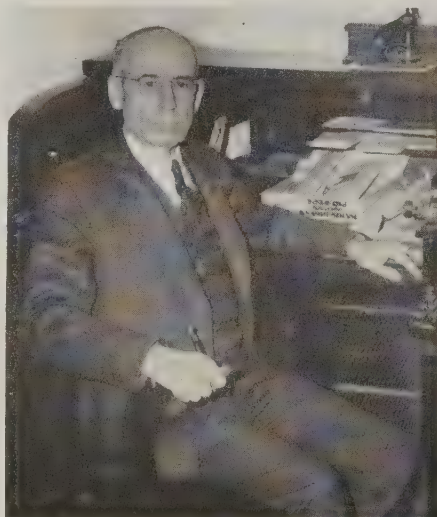
In February 1939, Mr. Hurd met with representatives of the other soil conservation districts in Oklahoma to form the Oklahoma Association of Soil Conservation Districts. He became its first secretary-treasurer.

When the "Friends of the Land" was organized in Washington, D. C., in 1940, Hurd was elected a vice president and member of the board of trustees.

For 11 years Hurd was Chairman of the Agricultural Commission of the Oklahoma Bankers Association. It was during this time that he initiated the Bankers Awards program. The first such awards were made in August 1942 to farmers for outstanding conservation work in the Arkansas-Verdigris SCD. From this beginning the Bankers Award program has spread throughout Oklahoma and many other States.

Mr. Hurd's understanding of agricultural problems was recognized in March 1942 when he was called to New York City by the American Bankers Association to represent the Tenth Federal Reserve District on the Food-for-Freedom Committee.

Through all the years, Hurd has been ready to do and to encourage anything which would help get conservation on the land. Very early it was found that rock phosphate was needed on the soil. No dealers were willing to handle it, so the district ordered carload after carload until a dealer was found. When mechanical bermudagrass planters were needed, Hurd encouraged a manufacturer to build them and the district bought the first machine. When new grasses appear which offer unusual promise, Hurd is ready to encourage their use.



F. S. Hurd.

The most recent emphasis of the district is on upstream flood prevention. Three separate projects are in various stages of planning. Although he has now turned the reins of active management over to another, Hurd's fondest wish is that he might live to see one of these projects completed and functioning.

—WILBER E. PARRISH

Close-Drilled Corn for Silage

Two South Carolina farmers are growing corn for silage in a new way. E. B. Mack of North and Joe E. Jones of Florence drilled the corn in 7-inch rows with a grain drill.

Mr. Mack planted corn in this way on 20 acres of land. He used $6\frac{1}{2}$ bushels of seed per acre and applied 1,500 pounds of fertilizer per acre. He irrigated the corn twice. The corn was cut for silage when about head tall and yielded about 30 tons per acre. There was no grain on the stalks.

"Corn makes an excellent erosion-control crop when planted in this manner," said J. T. McAlister, SCS conservation equipment engineer at Orangeburg.

Mr. Jones planted $3\frac{1}{2}$ bushels of corn per acre and fertilized with 1,000 pounds of 5-10-10 per acre. The corn produced 35 tons of forage per acre in a six-week growing period. He plans to grow two crops on the same land in one growing season by following this system of planting and harvesting.

Both of these dairy farmers are cooperators with their local soil conservation districts. Their goal in applying the soil and water conservation plans for their farms is to produce an abundance of high-quality forage and other feed for their cows and to conserve and build up their soil at the same time.

The Mail Goes Through

—Rain or Shine

By J. S. Livingston and J. F. Murphree

RURAL mail carriers usually are familiar with soil conservation activities along their routes but seldom derive any direct benefit from such work. Not so R. M. Singletary, Jr., who "carries the mail" on Route 1 from Cross, South Carolina. He claims that the conservation work along his route helps him deliver the mail more punctually.

Recently a group of farmers in the area applied to the Berkeley Soil Conservation District for help in draining their fields. The area involved 19 farms.

Soil Conservation Service technicians assisting the Berkeley district planned a drainage system for the area as a part of the conservation plans for the farms. ACP payments helped get the job done.

No new land was brought into

cultivation—just better drainage for fields which in the past had become waterlogged after each rain.

In commenting on the value of drainage to the community and to himself, in particular, Mr. Singletary said: "The drainage work done on the cropland adjoining the Spring Plain Road now allows continuous travel. Before it was done, large portions of cropland and road were covered with water during heavy rains and it was difficult and at some points impossible to get through. When heavy rains came I continued mail service by use of a jeep. Even with this mode of transportation, it was necessary to detour and in some cases travel through high points in the fields to reach all box holders. I'm glad to see farmers draining their land. Where roads are involved it always makes them better and I prefer to carry the mail in my sedan rather than in a jeep."

Note:—The authors are, respectively, work unit conservationist and soil conservationist, Soil Conservation Service, Moncks Corner, S. C.



R. M. Singletary (left) and soil conservationist John Murphree look at drainage ditch for cropland that has helped make county road passable during wet weather.

OFFICIAL BUSINESS

CHANGE OF ADDRESS SHOULD INCLUDE ZONE, OLD ADDRESS, AND CODE NUMBER

No State highways were involved, but the county road department worked closely with the district on this drainage project. Culverts already installed were increased in size and others added where needed to provide outlets from farm ditches and drains. The road serves about 50 families and the drainage has made wet-weather travel possible.

Increased Efficiency on British Farms

In Britain there are roughly 30,000,000 acres of farmed land. Another 16,000,000 acres are classified as "rough grazing" and consist mainly of hills. There are some large farms, but small ones predominate. Disregarding the smallest, which are often worked on a part-time basis, approximately two-fifths of the farms are less than 50 acres, and another two-fifths are between 50 and 150 acres.

Despite its small size, Britain varies greatly in its farming conditions. The south and east parts are generally flat, with annual rainfall from 20 to 30 inches; here arable farming is important. Farther north and west the rainfall is higher and the land more hilly, with the result that the land is mostly under grass, and livestock play a bigger part in farming systems. For the country as a whole, 63% of the farmland is in grass, either permanently or temporary grass sown down for from three to seven years; the percentage of

grassland varies from 15 to 85 between counties.

Agricultural production has increased by 60% since 1939, despite loss of land to buildings, roads, airports, and other nonagricultural uses, and despite a drop of 10% in the number of farm workers. Only one twenty-fourth of today's working population is employed in agriculture. But crop yields per acre have risen by about one-third, as have milk yields per cow, which now average 750 gallons for all the cows in the country.

Many factors have contributed to increased efficiency. Mechanization has played a big part. Although Britain is not thought of primarily as an agricultural nation, it is believed to be the most highly mechanized agricultural estate in the world. The first stage of mechanization—the simple displacement of horses by tractors—is now virtually complete; the number of tractors has increased tenfold to the present figure of about 500,000. And good progress has been made with the second stage, equipping the tractor with its own implements and controls so that it can do much that horses could never do. More advances in mechanization will certainly come, and already the first steps in the application of electronics to farming have been taken. Fertilizer usage has reached a high level, though there is room for more generosity to grassland; and application of lime, favored by government grant, is well organized so

that acidity now rarely limits production from the land.

Anyone familiar with British farming before 1939 would scarcely recognize it today. Progress has been due largely to the great scientific advance that has occurred since then; and it is certain that only by further application of science to farming can that progress continue.

—*British Affairs*

There is only one sure way to find out whether your crops are getting enough of the nutrients they need—a soil test.



Farmers today are getting 76 percent more nutrients per ton of mixed fertilizer than they got 30 years ago.



Geneticists are hoping to introduce nematode resistance into sugarbeets by manipulating chromosome numbers, according to Agricultural Research Service scientists.



In 1939, U.S. farmers produced 2.5 billion bushels of corn on 88 million acres. In 1959, they produced 70 percent more corn on 4 percent fewer acres.



In the past 20 years, the human race has increased in numbers by about 700 million. In the next 20 years, well over 1 billion people will be added if the present growth rate continues.

NOVEMBER 1960

Soil Conservation



SOIL CONSERVATION SERVICE • U. S. DEPARTMENT OF AGRICULTURE

CONTENTS

"If there is any activity of mankind that requires the most scrupulous use of all that conservation science and hydraulics can provide, it is the work of keeping our land permanently productive and making the best use of our water supply."

—HUGH HAMMOND BENNETT

PAGE

- 75 New Methods for New Problems
By Donald A. Williams
- 76 Zoning to Protect Agriculture
By Erling D. Solberg
- 79 Healing a Gully
By T. J. Davis
- 80 Portable Hydraulic Channel
- 81 A New Hustle
By Tarleton Jenkins
- 84 Dragline Irrigation for Apple Orchards
By William A. Bennett
- 86 New Wealth and Old on Oklahoma's Tablelands
By Bernice DeShong
- 89 Alternate-Row Seeding of Grasses and Legumes
By Herb Boddy
- 91 Tree Seeding by Helicopter
By M. P. O'Keefe
- 93 Put the Accent on Youth
By Bernhard A. Roth
- 94 James E. Nesson of Utah—A Profile
By Evan C. Thompson
- 95 Book Reviews



COVER PICTURE.—The Pennsylvania Turnpike, as it traverses Chester County, Pa. This is a part of the modern land use pattern of the U.S.A.

Soil Conservation

EZRA TAFT BENSON
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

TOM DALE, Editor

15 CENTS PER COPY

\$1.50 PER YEAR

FOREIGN—\$2.25 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

New Methods for New Problems

By Donald A. Williams

TODAY'S rapidly changing agriculture—larger farms, increased mechanization, vertical integration, greater emphasis on management skills, and the shifting of farmland to nonagricultural uses—provides the setting in which we must carry forward the soil and water conservation job.

Never before in the 25-year history of the Soil Conservation Service have we faced more rapidly changing conditions or been called upon to meet more complex problems. Nor have we ever had such a wide variety of conservation programs and interests to weld together into an integrated program that effectively deals with all the problems.

The rapidly changing conditions and increasing complexity of soil and water problems demand dynamic leadership on the part of those responsible for formulating and carrying out our conservation program.

We have to measure tomorrow's demands on our agricultural resources, not in terms of today's abundant production, but in terms of the needs of the estimated 230 million people we will have in the United States by 1975, or the 370 million people we may have by the year 2010. The Agricultural Research Service recently pointed out that, in order to meet even 1975 demands, "we must devise production improvements 30 percent faster than we did during the fruitful 20 years preceding 1956."

A considerable part of the production improvements may be made by breeding better types of plants and animals, controlling pests and diseases, and by better plant and animal management practices.

Some of the increase needed may be gained by bringing new or idle land into production or by converting producing land to more intensive uses. Still other gains may be made through improved processing, marketing, and distribution of agricultural products. But a great part of the increased food and fiber needed for our expanding population must be achieved by increasing the productivity of the land we are now using for these purposes.

The already keen competition for land and for water for agricultural, industrial, transportation, urban, and recreational uses will become even greater. The land taken from agriculture for nonagricultural uses probably will continue to exceed the amount of new or idle land we bring into production through irrigation, drainage, or clearing. And in many instances the land we lose to nonagricultural uses will be some of our most productive farmland.

Never before have we seen such widespread—and growing—appreciation of the role of our soil, water, grass, timber, and wildlife resources. Thinking people in all walks of life rapidly are coming to the realization that most of the great developments of our time ultimately could be meaningless if we do not maintain our resource base.

But these thinking people want to know what conservation means, not just in terms of combating erosion and preventing other types of soil deterioration, but in terms of wiser planning for the use of all our land and water resources—in terms of expansion potentials for industry, for transportation, for recreation, and for living room for the rapidly growing population as

well as production potentials for the food and fiber we ultimately will need. They are looking to the Soil Conservation Service, the soil conservation districts of the Nation, and other conservation agencies to supply the answers for these problems and to furnish the leadership required to solve them.

Obviously, the methods for dealing with soil and water and related resource conservation are having to be broadened to deal with these new problems. This is not to say that the basic principles of conservation are changing. The concepts on which the program of this Service was founded more than 25 years ago are still valid. The concept that land varies from field to field and that it can be classified as to its capability and needs and so used and treated is still valid. The idea of treating entire farms and ranches and entire watersheds as units is still valid. The assumption that soil conservation and water conservation are inseparable phases of one program still holds. These and other basic principles were the foundation stones of the early programs of the Service and still serve as such.

But the electronic, atomic energy, and jet-propelled age is with us. And with it has come a worldwide population explosion. These developments bring not only new, diverse, and complex problems; they also bring us rapid advances in science and in our abilities to apply new scientific discoveries to the jobs at hand. An important part of our future job must be to take advantage of these new scientific findings. If we fail to do this, we will fail to carry out our responsibilities.

ZONING TO PROTECT AGRICULTURE

Rural zoning can be used for or against farmers, depending on the purposes for which it is used. Farmers in California have learned to use zoning to the advantage of agriculture and the community as a whole. New kinds of zoning districts and regulations, including exclusive-type agricultural zoning districts, have been developed.

By Erling D. Solberg

IT once was an attractive and productive farm. It bore a proud name. Soils were fertile, fields and pastures were terraced and well tilled. Ponds and streams were clear. Buildings and fences were in good repair.

Today it is part of a rurban sprawl—a scattered, mixed development that is neither town nor country. Strings of houses commingled with stores and weed-grown lots border the roads. There are gas stations at the crossroads. Other houses are widely scattered among the remnants of fields that did not sell. Some of these fields, now idle, have reverted to weeds

and brush. Soil erosion is prevalent.

The change began when the owner sold his front lots. The prices received were high compared with the value per acre of the farm as a whole. Houses were built. Later, other farmers sold their frontages. The change continued as the years went by. Growth was haphazard. Many farms were bypassed and “trapped” in areas that are largely urban. Subdivisions farther out became residential islands.

Rurban sprawl can be found in most of our States. It is a byproduct of rapid, unguided community growth. Sprawl is a prolific producer of problems that are left behind as unwelcome legacies for the community, for the new sub-



Farmers in unzoned rurban areas may be forced to help pay for additional community centers such as this, schools, and other public services needed by their new urban neighbors.

Note:—The author is agricultural economist, Agricultural Research Service, Washington, D. C.



A New England apple orchard that is almost surrounded by suburban housing developments. The owner had refused to sell at the time this picture was made, but the price of land around him was getting higher each year.

urbanites, and for the remaining farmers.

Sprawl inflates taxes for farmers and nonfarm residents alike; it increases the cost of providing the needed roads, schools, and other public facilities and services.

Sprawl wastes farmland. Preliminary estimates indicate that every time unplanned urban growth converts an acre of farmland to urban uses, it wastes, on the average, three more agricultural acres. Two of these acres go out of farming into a ripening stage for possible later nonfarm uses. The other acre remains idle.

If in addition to rurban sprawl there is an unwise mixture of land uses — agricultural, residential, commercial, and industrial—serious conflicts between incompatible land uses may result. From the viewpoint of farmers who continue to farm in the area, these conflicts may be separated into three groups.

First, there is a shifting to farm taxpayers of development and pub-

lic service costs, among which are outlays for new roads, streets, schools, parks, water mains, sewers, and other public facilities and services. Farmers now have, and have paid for, many extra public facilities that are needed by their nonfarm neighbors, but which the farmers neither need nor want.

Second, there are adverse effects of nonfarm land uses that damage the agricultural plant and operations. These include the diversion from agriculture of the most level, the least erodible, and the most fertile land. Rurban expansion often takes such highly productive land first, even when other suitable land is available for nonfarm uses.

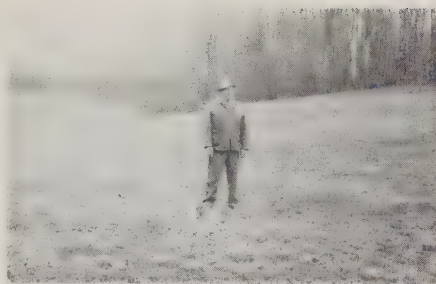
Other urban-induced damages result from depletion and pollution of ground waters; more frequent flooding of farmlands because of rapid runoff from roofs and streets; pollution of streamflows; injury to crops because of air pollution; and trespass hazards, particularly at harvest time.

Finally, problems are created because of objections of nonfarm people to certain normal farming activities. There are objections to smoke from smudgepots, spraying and dusting of tree and field crops, noise and dust from farming activities, and unpleasant odors and flies from livestock and poultry operations. These objections may result in the regulation of farming and feeding practices by health authorities.

What of the future? A growing population and better roads and more cars promise a wider distribution of population.

Population estimates for 1975 for the continental United States range from a low of 207 million to a high of 230 million. Estimates for the year 2000 range from a low of 261 million to a high of 361 million people.

Express highways built within the next few years will extend commuter zones. Space must be found for community growth, for



Sherman F. Gold, of Abingdon, Va., stands on a 3-acre homesite he has just purchased at an auction when a 135-acre farm was divided into 45 homesites. This development is in Washington County, Va., far from any large industrial or population center.

new homes, for business centers, and for industrial sites. Does this mean more rurban sprawl with its waste and its land use conflicts? Or can there be a more orderly community growth, perhaps with suburbias and farms side by side?

A workable solution has been effected by many burgeoning communities. They use planning and zoning tools to keep apart land uses that are likely to conflict. First, an overall plan of optimal land use is prepared. Then separate districts are established for agriculture, for residences, for business, and for industry.

Agricultural zoning districts may be grouped into three main classes.

Those of the first class enclose agricultural areas from which objectionable business and industrial activities are excluded. In these agricultural zoning districts, all kinds of farming activities, except hog farms for feeding garbage and offal, are usually permitted. Also allowed are farm and nonfarm residences, home occupations, schools, churches, and other facilities that are appropriate in residential districts. Other uses that are sometimes allowed are plants for processing and storing agricultural products, earth extraction industries, public utility facilities, and airports.

Most other uses and activities are prohibited in these farm zoning districts, especially wrecking yards, taverns, public dance halls, automobile courts, and trailer camps.

In the second class of farm zoning districts, essentially the same kinds of regulations are applied, with one important exception—the requirement of large minimum lot or tract sizes. Minimums ranging from 1 to 5 acres or more are required at times to discourage residential development and to reserve the land in these districts for agriculture.

In order to further these objec-



This formerly was a prosperous apple orchard in New England. It still is surrounded by dairy farms and orchards, but the future land use pattern is unpredictable because of a lack of local planning and zoning.

tives, the minimum size of tract must be large enough to discourage purchase for residential development, and to serve the primary purpose of the district, which is agriculture. Many types of farming require only a few acres.

In farm zoning districts of the third class, a more direct approach is used. Within these districts, only agriculture, a few related activities that further the use of land for farming, and certain public and semipublic uses are permitted. All other uses, including nonfarm residences, are excluded. As an added safeguard, minimum tracts of up to 10 acres are required.

California farmers have been especially pressed by rurban expansion in recent years. In self defense, they developed the third class of district described—the exclusive-type farm zoning district.

The primary land use in exclusive agricultural districts is farming. Other permitted uses are secondary and accessory. Residences, for example, are allowed as accessory uses to permitted agricultural uses.

Zoning regulations applied in exclusive-type farming districts are designed and used to protect agriculture. Land uses which require additional roads, schools, utilities,



Superhighways, such as the New Jersey Turnpike shown here, may consume large amounts of the best farmland, divide farms into uneconomic units, and cause other major inconveniences unless proper planning and zoning precede construction.

and other expensive public facilities and services are excluded. The same excluded land uses have been the main source of the objections voiced against normal farming practices and the main reason for conversion of fertile soils to nonfarm uses.

A dozen or more counties in California have created exclusive agricultural districts to protect a variety of agricultural areas. These include areas in orchards, truck crops, and general farming, and areas used for dairying, poultry raising, and nurseries and greenhouses. The districts differ from each other, and the regulations applied vary with local conditions and needs. Districts range in size from

a 35-acre zone used for growing field and greenhouse flowers to a district that contains 175 square miles and is devoted to several types of farming.

Agricultural zoning districts usually do not call for regulation of farming activities. Instead, conflicting nonfarm uses are excluded.

Exclusive-type farm zoning districts are established on petition by the farmers concerned. Before final action by the county board, careful studies are made, the recommendations of the local planning agency are submitted, and public hearings are held.

Productivity of soils is a major consideration in zoning land for agriculture. There is little point in reserving the poorer soils for agriculture.

When alternate lands of differing soil capability are available, and both are suitable for development for nonfarm uses, the community has a choice.

Benefits from reserving the better soils for farming will accrue to both rural and urban people. Benefits will go to people on the land from having an efficient and highly productive agricultural plant.

Other benefits will accrue to the community at large. Agricultural greenbelts can break up continuous urban development, lower overall population densities, and reduce pressure on travel arteries and on other public facilities. Other benefits may result from reducing runoff, avoiding flood damages, reserving natural storm drainages, protecting watersheds and wildlife, and by avoiding sprawl-inflated costs of public services.

A technological revolution, along with a population explosion, is carving new frontiers in rural communities. New urban forms are being shaped. Yesterday's sharp separation between town and country has been blunted. Farmers and city folk are now neighbors. Ways must be found to permit farms and suburbs to prosper side by side.



Factories and office buildings are moving to rurban areas at an accelerated pace. Unless proper planning and zoning are done in advance, such movements may severely disrupt the agricultural economy of an area.

Healing a Gully

By T. J. Davis

Large gullies on the J. F. Taylor farm, near Holdenville, Okla., got their start from emptying terrace water onto unprotected outlets. The terrace system was redesigned by SCS technicians assisting

the Hughes County Soil Conservation District, and the gully scars were healed in one season by shaping the banks, fertilizing, and planting to bermudagrass.

Note:—The author and photographer is work unit conservationist, Soil Conservation Service, Holdenville, Okla. This sequence of pictures

was given an award as the best photographic essay submitted by SCS employees in Oklahoma during 1959.



April 23, 1958.—The owner looks at the gullies.



May 14, 1958.—Shaping the gullies.



Aug. 3, 1958.—Fertilized and planted to bermudagrass.



Dec. 19, 1958.—A good grass waterway.

ARS and SCS use

Portable Hydraulic Channel

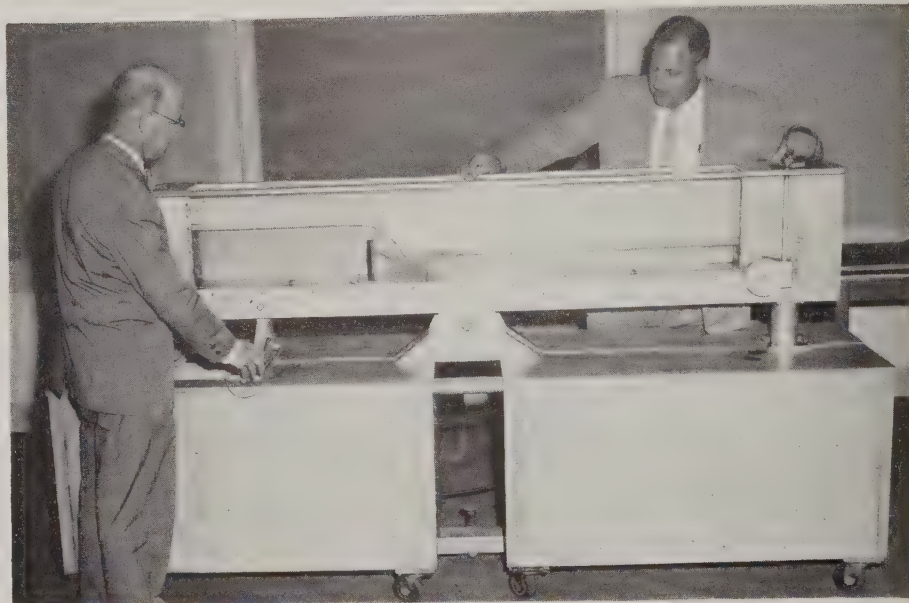
for demonstration and training

A miniature hydraulic demonstration channel, developed at the St. Anthony Falls Hydraulic Laboratory in Minneapolis, has been used extensively there for demonstrating various types of hydraulic structures. More recently, similar model channels have been built and are being used at SCS training centers to demonstrate to Service employees some of the principles of hydraulics and the effectiveness of different types of hydraulic structures.

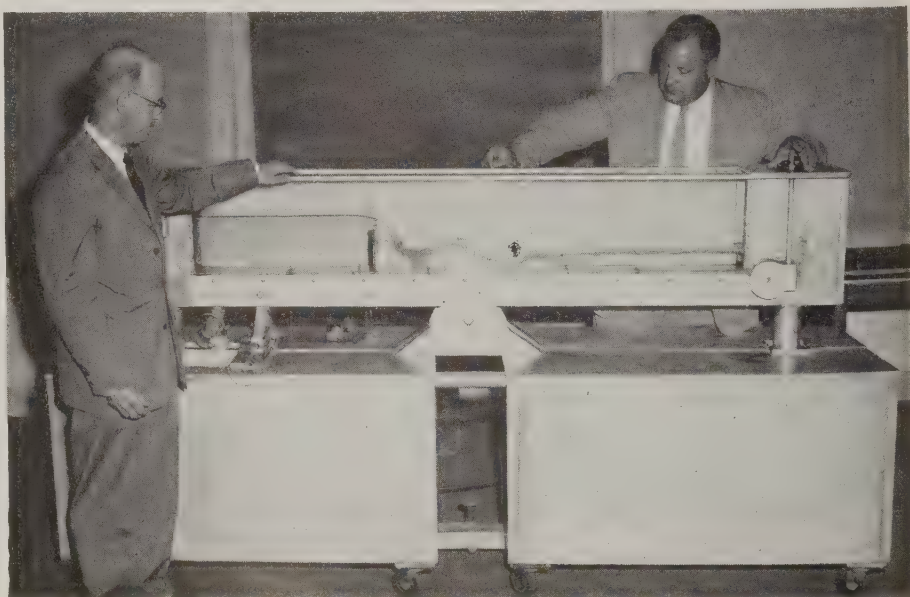
The model is a simulated stream channel about 6 feet long and 6 inches wide mounted on a frame above water tanks. The channel may be tilted to a slope of 10 percent or more. An electric pump circulates water from the tanks through the channel at any desired rate. More than 20 different types of hydraulic structures have been built to fit in the channel and may be used singly or in various combinations for demonstrations.

The performance of water flowing through or over the various structures in the demonstration model is quite similar to the performance of water in full-sized field structures. This is the chief value of the miniature models for testing purposes; they permit numerous tests of varied modifications of a structure with minimum cost and labor.

The channel and hydraulic structures for the demonstration model are made of transparent plastic. This permits visual observation of water performance, and greatly enhances the value of the model for demonstration purposes. The frame and water tanks are constructed mainly of aluminum. The entire model is mounted on wheels for



Fred W. Blaisdell (left) and George N. Osterson operate a hydraulic demonstration channel to show SCS employees how different hydraulic structures function. *Above:* Straight drop spillway stilling basin developed at the St. Anthony Falls Hydraulic Laboratory. The water flowing over the spillway falls onto a horizontal apron where the energy is dissipated by blocks. The water is discharged into the downstream channel in such a way as to prevent damaging scour. *Below:* Wisconsin Notch spillway stilling basin, one of the structures tested that proved unsatisfactory. Two transverse sills across the apron were supposed to dissipate the energy of the falling water; but as the flowing water hits the first sill it bounces and falls beyond the second sill. Some energy is dissipated by the sills, but not enough to prevent serious scour in the downstream channel.



easy movement. The electric motor may be operated by plugging into any 115-volt circuit.

Duplicates of the St. Anthony Falls demonstration channel now being used at SCS training centers are at Coshocton, Ohio, Athens, Ga., and San Luis Ibispo, Calif. About 600 employees of the Service will observe demonstrations of the performance of the 20-odd structures in these channels during 1960. Present plans provide for eventual installation of hydraulic demonstration channels in Service training centers at Stephenville, Tex., and Fort Robinson, Nebr.

The SCS training centers at the five locations provide training in the basic principles of soil and water conservation for all new employees, both professional and sub-professional. In addition, many special sessions are held for engineers and advanced conservation or en-

gineering aids. The hydraulic models are a valuable training aid used in all these sessions to demonstrate engineering principles as well as the importance of research and how it supplements the field program.

Special demonstrations were given to Washington employees of the Service during June, when one of the channels was brought to the Department of Agriculture for that purpose. During these demonstrations, the model channel was operated by George N. Osterson of the SCS training center at Coshocton, while explanations of the phenomena observed were given by Fred W. Blaisdell, hydraulic engineer of ARS at the St. Anthony Falls Laboratory.

Mr. Blaisdell, who is the supervisor of ARS operations at the St. Anthony Falls Hydraulic Labor-

atory, is the principal designer of this unique and valuable demonstration model. He has spent many years on hydraulic research, formerly with SCS and with ARS since 1954.

The ARS research at the St. Anthony Falls Hydraulic Laboratory is conducted cooperatively by the Agricultural Research Service and the University of Minnesota. Its principal functions are to develop and test hydraulic structures useful in soil and water conservation. Many types of structures developed or tested at the laboratory are now used extensively by SCS engineers and others engaged in water management or conservation. They also are being used more and more by State conservation engineers, highway engineers, and others who have problems of design for small or medium-sized water control structures.

A New Hustle

SCS Supervisors in Texas Profit from Management Training

By Tarleton Jenkins

THE local ball club was having a good year, the best the home fans could remember.

Every player showed he was giving his best on every play. No game was won by an opposing team until the final out.

Why? Everybody agreed on the reason. Management, they said. Under the new manager, there was a different atmosphere, a new sense of team relationship and spirit. There was a new, never-give-up kind of hustle.

Somehow, folks said, the new manager of the team had imparted the enthusiasm and loyalty, both to his players and to the "front

office," which he himself obviously felt.

Throughout the Soil Conservation Service, a determined movement in this direction is paying off with the same results.

It is management training. The "managers" of the local "teams" or units are brushing up on the principles of winning combinations of people and ways to get a better job done.

There are no real tricks, no magic formula. Most of the training consists of reviewing the ways in which successful supervisors in business, industry, government—

or in ball clubs—go about their supervision.

In Fort Worth, Tex., I looked in on one of these management training sessions. It was principally a series of roundtable discussions, with area conservationists taking the lead. Present were some 25 unit leaders, many of them real veterans of Soil Conservation Service technical help to soil conservation districts.

N. P. Stephenson, training officer for Texas, set the theme with the Galileo quotation, "You cannot teach a man anything. You can only help him find it within himself."

When State Conservationist Henry N. Smith approved a man-

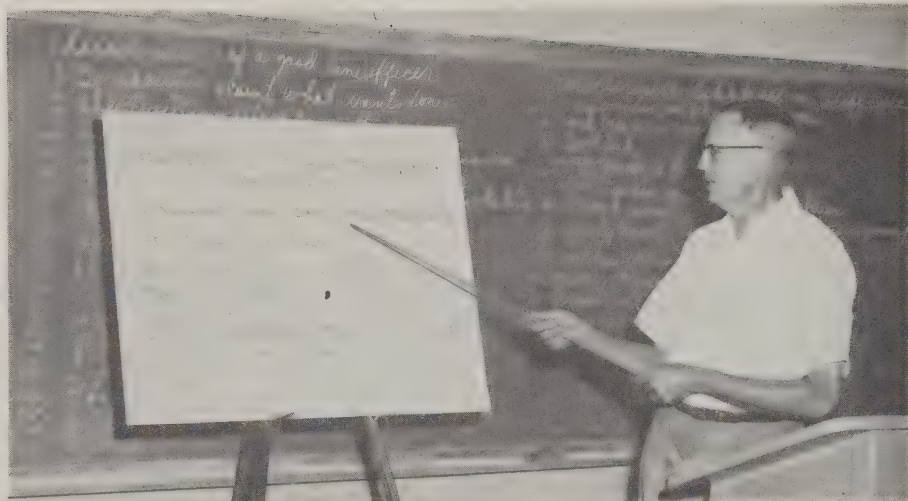
Note:—The author is information specialist, Soil Conservation Service, Denver, Colo.

agement training program for supervisory employees of the entire State, Stephenson set out to organize the course for the work unit conservationists. He scheduled 18 sessions.

Into the trainees' notebooks at the Fort Worth session, under the topic "Characteristics of High Producing Units," went such notes as: High group loyalty, effective communication, latitude to set own pace, supervisors self-confident and secure.

Under "Facts That Help Us Understand People," were penciled: A worker produces no more than he wants to produce; people use less than half their capabilities; personality failures account for twice as many job failures as lack of technical knowhow; all people have breaking points physically and psychologically; the majority of people are basically honest and want to please; people fear what others think about them; and we understand others only as we understand ourselves.

Area Conservationist James Abbot of Lubbock pointed out that a work unit conservationist's staff is his primary resource. But he also has a tremendous resource in people outside his staff. Production often depends on the amount and



Training Officer N. P. Stephenson leads a discussion on what it takes to become a high-producing supervisor.

effectiveness of supervision. A work unit conservationist's job is broken down three ways: organization-dictated—the activities required by SCS as an agricultural agency; job-dictated—immediate day-to-day responsibilities; and self-dictated—the reading and training courses for improvement, the analysis of methods and procedures for greater efficiency, and the relations work done.

In the matter of dealing with other people, the group recognized that psychological needs are just as impelling and real as physical needs. People need, and respond

to, recognition (as a personality to be seen and noticed); to understanding; to an awareness of being appreciated; to the chance to use capabilities to the fullest; and to acceptance by co-workers, superiors, and subordinates.

Some of these needs are more important for some people than for others. However, the needs are governed by laws just as unyielding as those governing physical needs. Without satisfaction of them, people may become anxious, tense, indecisive, and incapable of action. Quarreling, criticizing the boss, malicious gossip, insubordination, moodiness, and a "whipped dog" attitude—these may be the consequences of frustration in the job.

The group developed a check list for supervisors, with score points, which included:

Are my personal habits above reproach, do I have a good knowledge of the work to be done, am I dependable, do I accept criticism, do I use common sense, am I loyal to SCS, am I courteous, do I assume authority when necessary, is my personal appearance exemplary, do I take advantage of opportunities to improve myself?

The group agreed that the new employee's first day on the job is an important one. Here is a chance to put some of the principles of



Around the room were 25 SCS veterans, "managers" of as many work unit teams. Their "place cards" were shifted twice daily to promote fellowship.

good supervision into action. The new employee should meet the rest of the staff, get a pleasant introduction to the community, have a chance to get agreeably settled, and have a call by the supervisor on the new family in town. An announcement in the local paper of the new member of the unit may seem unimportant, but it is the kind of morale booster that can help get a new man off to a good start.

The work unit leaders had fun with a demonstration of the difficulty and importance of clear communications. Using a one-way telephone, one member of the group sought to instruct another in the next room in the arrangement of a dozen dominoes on the table in front of him. The second member could not ask for clearer information in any instance. Comparison of the second domino arrangement with the first got a real laugh (see pictures at right). The demonstration had served its purpose.

There was intense interest in the factors involved in high production as shown in a study of a group of workers in an industrial plant. The workers had been on a 48-hour-week shift. Put on a piecework basis, production went up a little. Given two five-minute rest periods, production again showed a slight increase. Longer rest periods—still an increase. Hours were reduced and free lunches started. Output still went up.

Then the worker group went back to the old schedule: 48-hour week, no rest periods, no piece work, no free lunches, no Saturday holiday. Production surprisingly went to an alltime high, a sustained 25-percent increase over the base period rate.

What was the explanation? This was the analysis: The original conditions in the experiment had disappeared. The scientists conducting the study had created a new and friendly world among the worker group, giving the workers a new sense of accomplishment and contribution. The change was purely

psychological, but they had a new sense of their value as workers, as members of the team. Their attitude toward their job had changed.



Jack McFarran of Gainesville (upper picture) gives instructions over a one-way telephone to Frank Duncan of Vernon (center) on how to arrange 12 dominoes in the same pattern as those before McFarran. Duncan is not permitted to ask questions. (lower) Duncan and McFarran examine the two groups of dominoes to see how well their one-way communications worked.

The training session was a most fruitful one for a group of men whose use of human resources, day after day, means so much in the overall conservation job in 25 soil conservation districts.

James Coppedge, veteran work unit conservationist at Denton, leaned back and grinned.

"You know," he said, "I've just got an awfully different picture of an old boy named Coppedge."

And another of the group appraised it this way:

"As a result of this I am sure I can be worth considerably more as a supervisor, an employee, a citizen, a husband, and a father."

This training is paying off in improved work performance. One area conservationist summed it up this way: "One of my work unit conservationists was nervous every time someone from the area office went into his work unit. His staff had no guidance. He griped about all the work someone should have done; he felt sorry for himself. He attended a management session about a year ago and today he is a different person. He has gained confidence, is doing a good job supervising his staff, and recently turned what could have been a mess into a good thing by working tactfully with another agency representative. This would not have been the case a year ago."

It is a good bet that, across the Nation, a new spirit is taking hold in many a Soil Conservation Service team. Its trademark is a new hustle, keyed by a few simple yet important principles learned by team "managers" in training sessions like the one in Fort Worth.

The Pennsylvania Department of Agriculture reports that the flooding Susquehanna River carried the equivalent of a 40-acre farm past Harrisburg every 6 hours between March 31 and April 8. The report is based on information collected by the Geological Survey which shows that nearly 2 million tons of sediment moved past that city during the 9-day period.

DRAGLINE IRRIGATION

For Apple Orchards

By William A. Bennett

BLAINÉ Madden and Cal Cooper are proving that dragline sprinkler laterals can be used in their orchards near Pateros, Wash.

Cooper and Madden had seen wheel-move and dragline laterals used on hay and pasture crops and were determined to give the dragline a try in their orchards. They contacted the South Central Okanogan Soil Conservation District for assistance in designing a sprinkler irrigation system for the 40 acres of young, hardy trees.

An SCS technician assisting the district designed the system. It was installed in the spring of 1959. The hydrant valve bases on the main water line were installed be-

low ground level so that farm machinery, and particularly the dragline laterals, could pass over the hydrants without causing damage. Eight-inch concrete pipe was slipped over the valve bases flush with the ground to give further protection against damage from farm machinery.

The permanent trees in the orchards are planted on $28\frac{1}{2}$ -foot squares, adequate spacing for the semi-dwarf trees. They have planted filler trees in the centers of these permanent tree spacings, which makes a distance between rows of only $14\frac{1}{4}$ feet. Each orchard, rectangular in shape, is about 880 feet wide (east to west) and 1,320 feet long. The main water lines run underground down the center of the orchards, north



End of a dragline lateral hitched to the drawbar of a jeep. Note the nut welded to the side of the pipe, which slips into the slot on the angle iron to give stability to the line while moving.

to south.

The dragline laterals are 440 feet long and made of 2-inch, 14-gage steel pipe with welded joints. Cooper and Madden believe that they will be able to use the dragline laterals indefinitely in the orchards since they have semi-dwarf spur-type trees. They believe that trees with these growing characteristics will need very few props, and the few that will be needed can be located to allow the jeep and draglines to pass freely down the rows. Two rows of filler trees were left out along the main lines to facilitate moving between the rows.

The laterals are designed to operate 12 hours at each set. After the irrigation period, the lateral is



Blaine Madden points out the S-curve in a dragline as it is pulled by a jeep from one set to another.

connected to a drawbar on a jeep and pulled to the other side of the main line for the next set. Each time the main line is crossed, the lateral moves up one row, or $14\frac{1}{4}$ feet. This gives a $28\frac{1}{2}$ -foot spacing between sets.

The most important part of the moving operation is to get a good **S**-curve in the initial 25 to 30 feet when the lateral is pulled between rows. After that, the lateral will track right along behind the jeep, snaking its way between the tree rows.

The hitch used is a simple one. Triangular notches were cut out of two sides of the end of an 8-inch piece of channel iron, which is bolted to a drawbar on the jeep. Two steel nuts, welded near each end of the dragline, fit in the notches of the channel iron. This connection lets the lateral be pulled forward and also keeps the lateral from tipping. No stabilizing device has been necessary for either the moving or sprinkling periods. Aluminum pipe with rubber elbows is used to connect to the hydrants so that the laterals won't have to be stopped at an exact spot to hook up.

Each orchardist has three laterals and their orchards are located side by side. When, in its cycle, one of the laterals reaches the north end of Madden's orchard, it is



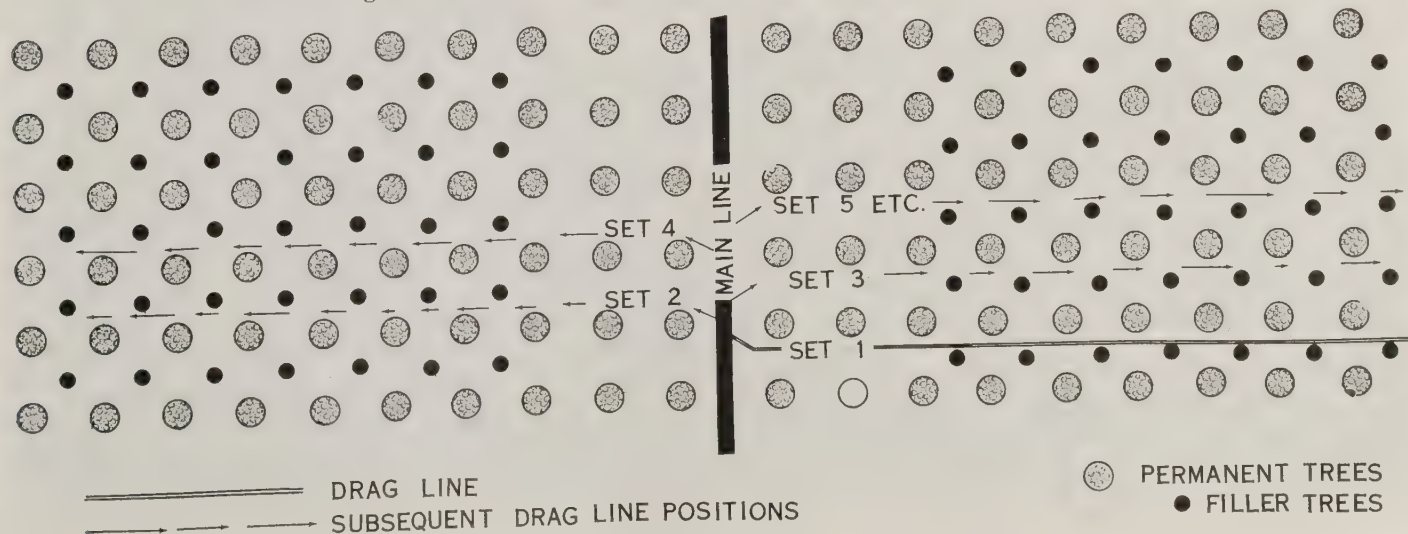
Madden completes the connection of the dragline to the main water line with a 12-foot length of aluminum pipe with rubber elbows.

moved to Cooper's orchard, laying to the west, where the cycle is continued. Likewise, when one of the laterals reaches the south end of Cooper's orchard, it is dragged over to Madden's orchard. This is a very important factor; that these two orchards are side by side so that the laterals can be traded back and forth after they have reached

the end of one of the orchards.

It takes approximately 25 minutes for each man to move the three laterals in his blocks. This means that by using the dragline laterals instead of conventional portable aluminum lines they save about $2\frac{1}{2}$ man-hours per day while irrigating.

Diagram of dragline operations on the Madden and Cooper farms.



on Oklahoma's Tablelands

By Bernice DeShong

THE "oldtimers" of Beaver County Oklahoma's Plains country, who have watched the stages of progress from the wagon train to the oil well, are becoming fewer and fewer with each passing year.

Soon, only the marks of progress on the landscape will be able to tell a first-hand story of the growth of Oklahoma's tablelands.

It was well over a half century ago that the long wagon trains from Kansas wended their slow and dusty way over the James Plummer Trail into Beaver County.

Judge Otto Barby was one of those early settlers who came to the Panhandle a decade before the turn

of the century when it was "No Man's Land," and claimed a homestead.

As school land became available for lease, he added to his holdings; and as some of the less hardy settlers moved away, he added still more.

In 1924, the ranch was organized as Otto Barby and Sons. The sons were Ralph, Otto Jr., and Lloyd. The ranch grew to 80,000 acres.

The elder Barby died about five years ago, and Lloyd—who was chairman of the district board of supervisors—died a year later.

The ranch was kept as a unit until two years ago when Ralph pulled out to operate his share independently, leaving the rest to be operated by Otto, Lloyd Jr., and

Mrs. Lloyd Barby.

As you approach the Ralph Barby Ranch from the south, you come to the Beaver River. In the old days, this was a treacherous, sandy stream that had to be forded, and you had to be careful to avoid the quicksand spots when you crossed it. Now a modern bridge spans the river. As you turn into the lane leading to the ranch house and headquarters, you can look out across a wide expanse of Beaver River bottomlands, covered with lush bluestem grasses in the spring and summer and dotted with white-face cattle.

The ranch house is located on the uplands adjoining this bluestem bottomland pasture. It is protected on the north by a range of tall

Note:—The author is clerk-typist, Soil Conservation Service, Stillwater, Oklahoma.



The lead wagon of a wagon train bringing supplies over the James Plummer Trail to Beaver County around the turn of the century.



Ralph Barby and part of his Hereford herd in a rejuvenated pasture where grass growth is now superior to that existing at the time of settlement.

sand hills which take the force out of the wintry blasts of the Plains country; and in the spring these hills are covered with wild flowers, green patches of skunk brush, and wild plum thickets.

Ralph Barby, who operates 40,000 acres and runs 1,500 cows, calls his Beaver County Ranch "just an ordinary cow outfit." However, by the measuring stick of both quantity and quality, the Ralph Barby ranch is much more than an "ordinary cow outfit"; and Ralph Barby—long interested in cattlemen's problems, and president of the Oklahoma Cattlemen's Association—is much more than an ordinary rancher.

In addition to the ranch's well-managed native grass, there are 3,000 acres that are used as supplemental pasture and to grow feed for the cattle. About 800 acres of wheat are grown each year, primarily for pasture, but a grain crop is harvested if the season is right. Other feed crops are cane, hegari, and sudangrass. The sudangrass is used mainly for summer pasture and hay. A good part of

the cane and hegari is cut and windrowed in the field. The cattle eat from the windrows, and only enough is baled for late winter use, usually about 400 tons.

Barby is a "conservation rancher," as evidenced by his fine pasture and range land, well-kept cultivated fields, and the abundance of wildlife throughout the ranch. There are turkey, deer, quail, and pheasants, and often you

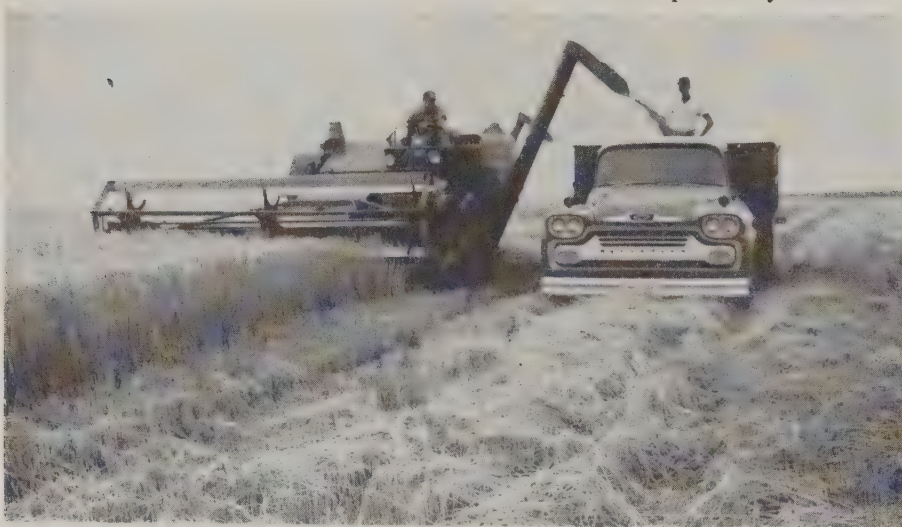
will see the old familiar prairie chicken which used to be so common in this Plains country.

Barby was one of the first in Beaver County to make use of the services of the soil conservation district. When the Great Plains Program got underway two years ago, he was quick to see the advantages offered, and signed up as a cooperator. His Great Plains contract calls for nearly every conservation



Harvesting alfalfa on irrigated land of the Ralph Barby ranch.

A self-propelled combine harvests wheat on the Ralph Barby ranch.



Oil and gas wells are now found in many of the wheat fields and ranges of Beaver County.

practice recommended by the district. Stockwater developments such as ponds and wells, terracing and diversion terraces, reseeding of rangeland by the new improved method of furrow drilling, contour farming, stubble mulching, and the planting of shelterbelt trees for windbreaks and protection have all been incorporated in his Great Plains plan.

The Barby Ranch is "big business," but it is not operated from a desk. During cattle running time, it is a common sight to see Barby riding his Palomino horse, bringing in cattle to the loading chutes. He

maintains well-kept headquarters, corrals, and loading chutes; it is a working ranch, however, and all facilities are made for service just as they have been through the years. Cattle trucks have largely replaced the long cattle drives. Most of the cattle are loaded on trucks and transported to the corrals for branding, dehorning, or shipment.

The main product on the Barby ranch is high-quality calves. However, he produces some fed cattle and some purebred Herefords for breeding stock, with an occasional bull which he will sell to a neighbor.

With Barby's well-earned reputation for high-quality calves, there isn't much of a marketing problem on the ranch. Calves are sold at the ranch, the whole crop frequently going to one buyer.

In the old days, the only sounds to be heard in Oklahoma's Plains country on a still night was the dismal wail of a coyote, or the mournful singing of a cowboy as he rode the range. But the Old West has undergone a "face-lifting." Mixed with the Old West's familiar sounds now can be heard the constant purr of the motors pumping gas and oil from down deep in Oklahoma's tableland. In many respects this has been a boon to ranch operations by supplying new capital and wealth to the area. Among other things, this modern trend has produced better roads which permit travel all seasons of the year.

Yet, present-day ranchers, as did the pioneers, still recognize the importance of grass in their economy. District cooperators in the Panhandle counties—Beaver, Texas, and Cimarron—are taking advantage of cost-sharing available through the ACP, Conservation Reserve, and Great Plains programs. To date, 245,155 acres have been seeded to grass.

The few "oldtimers" that remain in Beaver County have seen a lot of progress in the last fifty years, progress that justifies the faith of the pioneers in Oklahoma's "Heaven's Tablelands."



More than 16,000 Certified Tree Farms in the United States in 1959 were growing more than 51 million acres of trees, according to American Forest Products Industries. During the 1958-59 planting season more than 2 million acres were planted to trees.

Alternate-Row Seeding of Grasses and Legumes

By Herb Boddy

MORE and more Pacific Coast dairymen like the results they're getting from alternate-row seedings of grasses and legumes.

The alternate-row technique holds real promise for pasture builders whose old broadcast seedings and mixed seed drillings haven't paid off too well.

Some legumes and grasses grow well together and some don't. Alternate-row seeding means that hard-to-start legumes and those that don't compete too well with grasses grow in their own row. Given more space, legumes get off to a good start and keep on growing right beside neighboring rows of grass.

Washington and Oregon farmers who use alternate-row seedings say

Note:—The author is information specialist, Soil Conservation Service, Berkeley, Calif.

the method turns out more feed, hay, humus, and fertility plus a better balanced ration for cows.

Milk and butterfat yields of many dairy herds dip and waver when legumes fail to keep up with faster-growing, take-over grasses.

Take birdsfoot trefoil, for example: When trefoil is seeded with grass, poor stands often result. And when trefoil is seeded alone, weeds and weedy grasses are the rule. The same is true of legumes like alfalfa.

Robert MacLauchlan, SCS plant materials specialist with headquarters in Corvallis, Oreg., has helped many dairymen and farmers seed the alternate-row way.

He says, "Putting legumes in one row and grasses in another cuts down competition between the two species.

"Farmers tell us they get good

results from such seedings and our field checks bear this out.

"Farmers west of the Cascades find it hard to keep good stands of alfalfa or birdsfoot trefoil with a grass for more than two or three years. These legumes should be deferred in the spring for silage or hay. But the slower-growing legumes can't keep up with the more vigorous grasses in the cool, wet spring. It's a different story when grasses and legumes are planted in alternate rows.

"Results of five years of trials at the former SCS nursery at Bellingham, Wash., showed three times as much lotus in an alternate-row Cascade lotus and grass seeding as in a mixed planting of competing lotus and grass.

"Grass gives fields added protection against erosion, and perennial



The first cutting, each season, of alternate-row-seeded Cascade lotus and Alta fescue on this farm is taken for silage. Later cuttings will be harvested as hay or for lotus seed.

grasses like Akaroa orchardgrass and Alta fescue add tilth and body to soils. Alternate-row stands of Alta fescue and alfalfa produce about twice as many roots as alfalfa planted alone."

So far about 100 successful alternate-row seedings have been made in 35 soil conservation districts in western Oregon and Washington.

Carroll Ellison, who runs a 60-acre dairy in the Mt. Angel Soil Conservation District, Marion County, Oreg., is happy about the gains he's made from alternate-row seedings.

A 1954 Grassman-of-the-Year winner in the Clark-Skamania SCD in southwest Washington, Ellison changed over to alternate rows soon after he moved his 17-cow herd to Mt. Angel three years ago.

"My pastures were really run down when I moved on," he recalls. "The clovers I broadcast-seeded lasted only a year or so and I soon had a sod-bound pasture.

"In 1957 Mel Rigdon of the Mt. Angel SCS office began helping me work out my problems. Following his recommendation, I seeded 21½ acres in alternate rows. The seed-



Alternate-row seeding of orchardgrass and New Zealand white clover on the Winston Petty farm in the Mt. Angel SCD of Oregon.

ings included 5½ acres of Cascade lotus and Alta fescue; 6 acres of alfalfa and orchardgrass; and the rest in orchardgrass, Ladino clover, and New Zealand white clover—legumes in one row and grasses in another.

"I figure I can add around 500 lbs. of milk per cow per year by keeping about half of my acreage in pasture with the rest in hay and silage in alternate-row seedings. It means I can increase the pasture ration per cow and average 10,000 lbs. of milk per head."

Do cows feed up and down legume rows and skip the grass? Some farmers say yes. To keep cows on a balanced diet, Ellison uses the ration or paddock grazing system. He turns cows on a new strip of alternate rows of legumes and grasses each day, then rests the strip for three weeks before pasturing it again. He likes to put his cows on the pasture when the grasses and legumes are 8 to 10 inches high.

Here's how Ellison puts in his alternate-row seedings:

He plows fields once, disks twice, once in each direction, harrows, and rolls until the ground is firm (in the Mt. Angel SCD area seedbeds must be well prepared and firm). Then he applies 200-300 lbs. per acre of 16% nitrogen and 20% phosphorous fertilizer, harrows it, and rolls it in. Harrowing is done ahead of the roller and in one operation. Sometimes he rolls a field five or six times to firm up the seedbed. He irrigates before working up the seedbed when ground moisture is low.

In seeding, he uses a double box drill and plugs up every other hole in one box and the opposite cup in the other box. Legume seed goes in the grass seed attachment and grass seed in the grain box. Each box is calibrated at the desired rate of planting.



Carroll Ellison, Mt. Angel SCD cooperator, (left) and Mel Rigdon, of SCS, check alternate-row seeding of orchardgrass and Ladino clover on the Ellison farm.

He uses the SCS-recommended mixture of orchardgrass (blue tag), 4-5 lbs. per acre; Ladino clover and New Zealand white clover, 3-4 lbs. When he uses alfalfa for the legume he seeds 5-6 lbs. per acre.

Those who use a drill without a small seed attachment can block off each hole with dividers made from cardboard and held in place with masking tape. Mix enough clover seed for three acres with 27 lbs. of rice hulls and pour into every other compartment. Take another 21 lbs. of rice hulls and mix with amount of grass seed for three acres and put in the opposite holes. Set the drill for 160 lbs. of barley per acre.

Ellison fertilizes according to the appearance and production of a pasture. Usually a season total of 80 pounds of nitrogen and 70-80 pounds of phosphate is applied in split applications.

He keeps cows off a new alternate-row seeding until after the first cutting of hay. He says, "If you can pull grass and it will break off without pulling roots out, it's ready for grazing."

Ellison credits his alternate-row seedings for the steady milk and butterfat gains made by his 20-cow herd. He has made the national honor roll of the Purebred Dairy Cattle Association the last two years.

In 1957 and 1958 the yearly average of his herd was 9,829 lbs. of milk and 476.3 lbs. of butterfat per head. That's a gain of 453 lbs. of milk and 21 lbs. of butterfat per head over his yields when he used broadcast-seeded pasture. He made these gains with 10 first-year milking heifers in the herd last year.

Alternate-row seedings take a bit more time and effort than other seedings. But the way some of the first farmers to use this technique have continued to plow out old pastures and put their stake in alternate rows is a pretty good sign that they are a good bet for hay and pasture.

Tree Seeding by Helicopter

By M. P. O'Keefe

THOUSANDS of acres of brushland in Clark County, Washington, may be on the way out in the near future as the result of a short visit by a helicopter which sowed Douglas fir seed over three widely separated small ownerships. Although the amount of land treated is relatively small, only 110 acres, it is felt that a start has been made toward eradicating brush and providing for tree farms in the future in the Clark-Skamania Soil Conservation District.

According to Fred Pratt, county farm forester, there are approximately 112,000 acres in need of reestablishment in the county. The original stands of Douglas fir were logged off and failed to regenerate naturally before brush and hardwoods took over. Most of this land is best suited to timber according to the program of the district.

About 75 percent of this land is in the hands of small-acreage landowners, many of them absentees. The ownership of the land used for these first plantings by helicopter is representative: D. W. Doty is on duty with the U.S. Army in Formosa as a career officer. James Joyce is a missionary in Japan, while William Staninger resides in Oregon. None of the owners were present when portions of their lands were being treated.

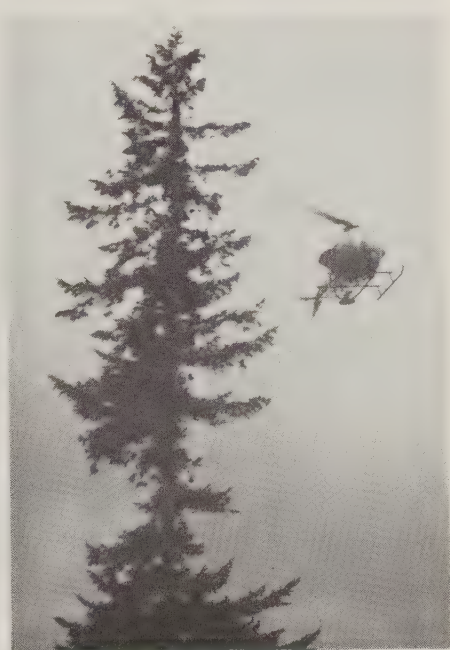
Aerial seeding of land to trees by helicopter is not a new idea. Large timber companies have used this time-saving method to reforest in recent years. In the 1956-57 season, more acres were aerial-seeded in western Washington than were

planted by any other method. A man can seed 10 acres a day with a cyclone hand seeder; a helicopter can seed seven acres a minute.

The helicopter used in Clark County was operated by a contractor out of Seattle. The contracting company is still experimenting with the use of aerial



Loading seed hoppers on helicopter before taking off for seeding operations.



Helicopter in flight while seeding trees on prepared site.

Note:—The author is soil conservationist, Soil Conservation Service, Vancouver, Wash.



Bulldozer used to scarify ground and brush in preparation for helicopter seeding of Douglas fir.

seeding on small holdings. The December seeding was the first such test in Clark County.

Two tanks which hold 200 pounds of seed each, enough to seed 800 acres, are mounted on two sides of the machine just behind the engine. Distribution is pre-set and the seed fed into a disk-like cylinder near the rear of the ship.

The cylinder is retractible and can be raised when landing and lowered when seeding to prevent damage to seed dispelled rapidly

from the cylinder, which makes 1,000 revolutions a minute. Seed striking the landing sleds could be severely damaged.

The helicopter flies at an average altitude of 200 feet and at 45 miles per hour. The seed is broadcast in 80-foot strips with each pass. The rate of application is one-half pound per strip, or around 20,000 seeds per acre. The seed is treated with Endrin to repel rodents, then coated with aluminum flake for identification purposes and to repel birds.

Before seeding, the land must be scarified. Scarification consists of uprooting brush and other competing growth to expose mineral soil. The residue from this operation need not be cleared off the land, windrowed, or burned; it may lie where it falls.

Survival rates have been as high as 16,000 seedlings per acre, according to company reports. A stocking rate of 800 to 1,000, depending on the site, would be adequate. The number of surviving trees can't be guaranteed because of the numer-

ous variables to which all plantings are subject.

The cost to the landowners on the three sites averaged \$7.50 an acre. This low cost was possible through Agricultural Conservation Program cost-sharing. Total per-acre costs are \$15 for scarifying the land and \$9.75 for planting by helicopter, which includes the seed, repellent treatment, and application.

Forestry technicians estimate that planting by helicopter rather than by hand cut costs by two-thirds, and when a stand is established it actually doubles the value of the land.



According to a recent survey of families living in rural areas of 7 counties in eastern Tennessee, half the rural families were nonfarm families and half were farm families. Of the farm families, more than half had nonfarm income that was greater than their farm sales. Fewer than 1 in 4 of the rural families depended on farming as their major source of income.



About three-fourths of all workers on the Nation's farms are family workers. USDA figures show that of the 7½ million farm workers last year, only about 1,900,000 were hired workers. These figures compare with twenty years ago, when 2,700,000 of 11 million farm workers were hired workers.



Phytochrome is the name given to the light-sensitive pigment recently found by ARS scientists to be the triggering mechanism for plant growth.



It takes 115 gallons of water to grow enough wheat to make one loaf of bread.



The sixth annual National Farm-City Week will be observed November 18-24, to promote a better understanding between rural and urban people.



P. E. Johnson, field representative of the contracting company that did the seeding, points to fir seed distributed by helicopter.

"Put the Accent on Youth"

By Bernhard A. Roth

"WE need much wider backing for soil conservation's future. To get it, I can't think of a smarter move than to go after our future citizens—right now. Of course, I mean the kids. The best way to enlist them is through teachers who have their confidence."

The words are those of Howard B. Thornburg, Barboursville, W. Va., SCD leader and president of the Cabell County Board of Education for nearly a decade.

"I don't mean we should throw in the sponge on trying to reach adults through the press, radio, TV, and so on. That effort must continue. What I'm talking about is where I foresee the biggest payoff of all: I'm convinced it's with the youngsters and the educators in charge of them."

Thornburg's convictions are all the more impressive in the light of his activities. Erasing ignorance of soil conservation has been a strong theme in his career as a supervisor of the six-county Guyan SCD, Northeast Area vice president of the NASCD, and member of the State Soil Conservation Committee.

His particular pet project is the annual 3-week Conservation Workshop for Teachers held at the State University in Morgantown. "They carry a wonderful story back to the kids and to the communities," says Thornburg. To keep the workshop flourishing and to raise scholarship funds for teachers, he has helped organize conservation education committees in 42 of the 55 counties. A delight for Thornburg in recent times has been an increasing number of \$1 and \$5 contribu-

tions from "just plain ordinary citizens." He believes that the more people the program can touch—in any manner—the rosier soil conservation's prospects will be.

A far-reaching product of the workshop is an 80-page, illustrated guide for teaching resource management, entitled "Living, Learning, Loving West Virginia." Containing handbook material for use all the way from primary through secondary schooling, copies are available in every public classroom in the Mountain State.

Thornburg has specific ideas regarding teachers and soil conservation. "Get them out on the land

—let them see what it is—let them know why it is—and invariably they get as fired up about the program as any other subject—often more so. I like to think of our efforts with teachers as smart 'wholesaling.' Get just one of them enthusiastic about the soil and let your imagination dwell on the thousands of kids that one teacher may infect with the same outlook throughout a 20- to 30-year career!"

Looking out across his deep-soiled Guyan Valley bottomland ringed by ancient, wooded hills, longtime dairyman Thornburg likes to philosophize with visitors who



Girl Scouts and friends planting trees at the Girl Scout Camp near Balls Gap, W. Va.

Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.

share his zeal for conservation. "Sometimes I think we overlook how spandy-new our program really is. Twenty-five years is hardly a tick of the clock in history. All the more reason, I figure, to look sharp to the younger crowd. They're the ones who'll change things!"

To illustrate, Thornburg describes a meeting he had with engineers of a nearby power plant development in the midst of a coal field near Huntington. Said the engineers: "When we put that plant up—and for a long time afterwards—we could always count on a good head of water all year round. Look at that stream now—flooding today, a mere trickle tomorrow. What in the world's going on?"

Says Thornburg with a grim twinkle: "I took one look around the valley—saw that most of the vegetation had been clear-cut or burned and chewed up with mining operations. It was a sight. So I told them plainly their watershed was 'shot.' In fact, I said what they had left amounted to nothing more than a 'tin roof' . . . Keep in mind they were high-grade, educated men . . . educated in everything except in what happens to water when you abuse the land!"

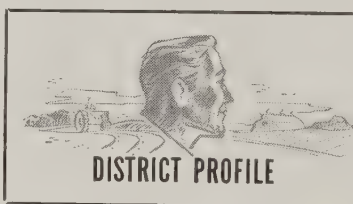
What special assistance do educators need for more effective conservation schooling? Thornburg's thoughtful answer is that teachers

can use much greater quantities of reference materials than they now can lay their hands on. Course outlines, ideas for demonstrations and field trips, comic-book-style pamphlets that amuse and inform youngsters—these are all useful and in short supply, says Thornburg. "But I have a hunch that as soon as we have enough teachers warmed up on the subject, you'll see them searing up their own materials, or doing a good job of needing others to supply the stuff."

Can he think of any other "secrets" to conservation education? "I believe there is one that can be used up and down the line. I'd select the word 'contact.' Soil con-

servation needs personal, man-to-man, working contacts with every conceivable segment of public and private interest. "We've got to show clearly that we're not just a bunch of starry-eyed dreamers off in a corner. We've got to make it plain that our 'soil and water' and 'bread and butter' are one and the same. Our county conservation education committees here in West Virginia are beginning to do just that!"

To assure himself that current progress in public understanding will accelerate, Thornburg plans to retain his executive post on the State Conservation Education Council.



James E. Nesson of Utah

FOR a fellow starting out with 17 big gullies splitting his grainlands, Utah rancher James E. Nesson has come a long way toward good land use.

Nesson licked the gullies and went on to serve as NASCD Southwest Area Vice President and to become a busy conservation steward of the land. He has found these experiences stimulating and challenging.

Today, his 400-acre wheat and fallow land is one of several well-kept farms in the Howell community of Box Elder County.

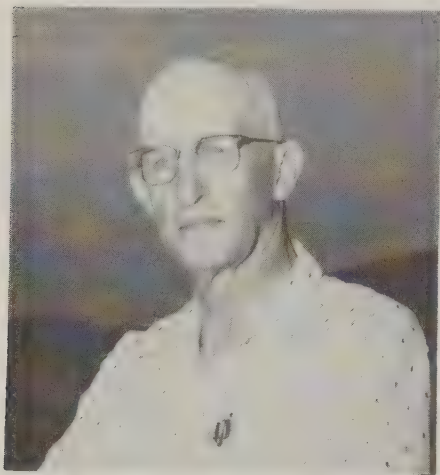
A persevering leader in spreading the gospel of good land use, Nesson has inherited much of the pioneering vigor of his father, Nephi.

In 1909, young settler Nephi moved to the wide, open spaces of Howell where he broke the present farm out of sagebrush and sowed it to grain.

Nephi had his ups and downs in farming and there were lean and good crop years before he turned

over the holdings to son Jim.

"The Soil Conservation Service helped me work out a farm plan soon after I took over the land," Jim explains. "The plan looked good on paper but it took some prodding from my neighbor, Carl



Howard B. Thornburg



James E. Nesson.

Shriber, before I got around to really working the plan.”

A member of the Flying Farmers of America, Jim Nesson began spotting his soil and water problems from above, an acre-by-acre reconnaissance which speeded up the job of safeguarding and improving his lands. Aerial spotting worked out so well he piloted his neighbors on hops over their lands.

The Howell rancher took to the air many times to photograph and keep tab on the progress of his conservation work.

He was among the first ranchers in Box Elder County to fall-till and chisel his lands to store up added moisture, reduce soil losses, and lessen frost damage.

Nesson likes contour stripcropping as an erosion buffer on his sloping grainlands. And he's thoroughly sold on stubble mulching ("haven't plowed my land since '47") as a good soil and water saver.

Heavy applications of chicken manure and commercial nitrogen fertilizer spread on his wheatlands increased the average protein rate from 10.5% to 13%.

Being a conservation farmer is a full-time job. Still Nesson finds time to give leadership to several of the major soil and water activities of his community and State.

Besides serving as an NASCD area vice president, he is a supervisor of the Northern Utah Soil Conservation District and chairman of the committee sponsoring the Blue Creek-Howell Watershed project.

In his own community, he has been treasurer of the town board for many years and has always been an active churchman.

Nesson has done a lot of forward-thinking on urban sprawl. He says, "It's a shame to see so much of our top farm and ranch lands go into urban uses. There'll come a day when our people will wish they had that good land in crops."

—EVAN C. THOMPSON

Continuous Corn Needs Proper Management

The increasing popularity of continuous corn has caused many farmers to rush blindly into this program. Before taking this step, they might take a look at the lesson taught by the Morrow Plots, the oldest soil experiment field in America, located on the University of Illinois campus at Urbana.

One section has grown corn continuously for 84 years. Part of the continuous corn area has received no soil treatment during the entire period. This area yielded 26 bushels in 1959.

A new management program including liming, thicker plant population, and heavy fertilization was put into effect on part of the untreated area in 1955. The yield immediately shot up to 86 bushels, an increase of 50 bushels over that on the untreated area. Three years with yields of over 100 bushels followed. All four of these years were favorable for corn.

The dry season of 1959 taught an important lesson. The yield on the newly treated area dropped to 56 bushels. All of the plots showed lower yields, but none were so serious as on this area.

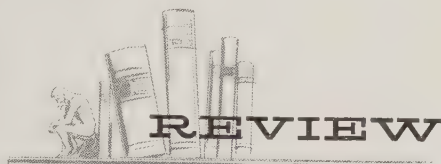
Much of the decrease in yield can be explained by the organic-matter content of the soil. The plot is very low in organic matter. Although nutrients were supplied after 1954, the tilth is still very poor. This soil was not able to store and furnish enough water for the corn during the dry year of 1959. A great reduction in yield resulted.

Another section of the continuous corn plot has received manure, lime, and phosphate since 1904. This area yielded 83 bushels of corn in 1959. The difference illustrates the importance of management in a continuous corn program.

Continuous corn has other drawbacks. Maintaining soil fertility costs much more. Continuous corn will remove a greater amount of

nutrients than will a rotation containing legumes. Legumes add nitrogen from the air, while commercial nitrogen must be added to continuous corn.

A great amount of risk is involved in the all-corn operation. If corn borers, dry weather, hail, or low corn prices present themselves, the continuous corn farmer could get hit hard financially. But if the operator has other crops besides corn, probably at least one of his crops will come through and make a profit for him.



THE SOIL AND ITS FERTILITY. By Henry Teuscher and Rudolph Adler, with the collaboration of Jerome P. Seaton. 446 pp. 1960. Reinhold Publishing Corporation: New York. \$12.

The cover of this big book suggests a welcome surprise—a book on soils by Canadian authors. But alas, the book deals only tangentially with soils and makes little use of the rich Canadian experience in soil research and management. The writing has the musty odor of Liebig's laboratory and of old library shelves.

The text is a curious mixture of much old and some new material from inorganic and biological chemistry, fertilizer technology, plant physiology, genetics, biology of soils, agronomy, horticulture, history, and soil science. It has a good deal about chemical processes that do, could, or might go on within plants, soils, and rocks.

Of the many "soil types" (great soil groups), four are discussed: Podzols, Chernozem, Rendzina, and "laterite" (*sic*). Why these particular ones and no more is unclear. The authors explain on page 10 that "... different types can be

If your address changes, please notify us of your complete new address, including zone or RFD number, and include old address with our code number as shown above.

defined only in large groups, and, the smaller the subdivisions become, the less well defined can they be . . ." This logic clearly antedates John Stuart Mill.

Only a little is said about erosion, but that little is forceful. Even in western Europe during the Dark Ages "the invaluable topsoil, deprived of saving humus, was washed away in large-scale erosion."

Further, on page 144: "It has been estimated that approximately 282 million acres of farmland have been ruined and another 775 million acres have been seriously damaged through erosion in the United States alone." But there the matter is dropped as if that were the end of the story, except for an admonition that farmers should change their outlook! Little or nothing is said about the enormous improvements of the past 25 years—nor how they were achieved.

A large number of items known to be important to soil productivity are mentioned. So are a large number that are a bit speculative or remote from the title, including agrobiolgy, Baule units, vitamins, plant mutations by treatment with mustard oil, the infinitesimal calculus, and poisonous humus.

The index is a bit sketchy.

The book is not suggested for a personal library supported by a modest budget.

—CHARLES E. KELLOGG

ADVENTURES IN ECOLOGY: HALF A MILLION MILES: FROM MUD TO MACADAM. By Edith S. Clements. 244 pp. Illus. 1960. Pageant Press, Inc.: New York. \$5.

Two outstanding scientists who made lifelong careers studying plants in their environment were Frederic E. Clements and his wife Edith S. Clements. For years this illustrious husband-and-wife team worked as research ecologists for the Carnegie Institute of Washington, D. C. Starting at Carnegie's Desert Laboratory at Tucson, Ariz., they later transferred to an outdoor winter laboratory at Santa Barbara, Calif., and summered at their mountain gardens on Pike's Peak adjacent to the famous cog-road between Manitou, Colo., and the mountain summit.

Frederic and Edith Clements studied continuously the Great Plains and mountain vegetation, and their classic ventures over the crooked, uncharted desert and mountain roads make an interesting chapter in pioneer western American history. Their books on plant ecology and botany have been standard texts for several decades. Frederic died in 1945, but Mrs. Clements still carries on actively.

Fortunately author-artist Edith Clements has just published a charming written account of her experiences. She is a witty storyteller, and the numerous tragic-comic experiences of the ecologist on wheels come off as humorous

episodes. Being stuck in a muddy desert wash or being helplessly high-centered on a mountain road wasn't funny at the time, but the author presents the post-comic features of such experiences with the mirth of a philosophic motorist. She painlessly sneaks in vital facts about ecology which are delightfully informative.

The Clements are old friends of the Soil Conservation Service, having served as Service advisors in conservation ecology for many years. A considerable part of the book is given over to their early conservation work and their field experiences with many Soil Conservation Service personnel.

—B. W. ALLRED

A memorial fund honoring the late Hugh H. Bennett is being established in the form of donations to the new Soil Conservation Society of America headquarters building to be erected in the vicinity of Des Moines, Iowa. The new building will have a "Hugh Bennett Room," which will contain his portrait and writings.

The National Association of Soil Conservation Districts has announced that the Soil Conservation District Foundation has received several contributions to the Foundation in the name of Dr. H. H. Bennett, since his death in July.

Total water use in the United States quadrupled from 1900 to 1950. It is expected to double again by 1975.

DECEMBER 1960

Soil Conservation



"Two hundred generations of men and women have given us what is in our minds about soils and soil fertility—the arts and skills and the organized body of knowledge that we now call soil science."

—CHARLES E. KELLOGG

CONTENTS

PAGE

- 99 Soils—The Key to Proper Land Use
By Donald A. Williams
- 100 Soil Surveys Furnish Basic Data For All Land Uses
By Roy D. Hockensmith
- 106 A Realtor's Views About Soil Surveys
By Verlin W. Smith
- 109 By Reservation Only
By R. W. Eikleberry
- 111 Building Soil With Grass
By Roe D. Crabtree
- 113 A Lot About Snow
By Tarleton A. Jenkins
- 115 Snow Survey Forecasts Make the Difference
By Clarence Hedrick
- 117 Irrigating Grain Sorghum for Efficient Water Use
By Jack T. Musick
- 119 Book Reviews



COVER PICTURE.—A soil surveyor at work in Montgomery County, Maryland.

Soil Conservation

EZRA TAFT BENSON
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

TOM DALE, Editor

15 CENTS PER COPY

FOREIGN—\$2.25 PER YEAR

\$1.50 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Soils—The Key to Proper Land Use

By Donald A. Williams

OUR soil and water conservation program must begin with the soils. The soils determine, to a large extent, the productivity and potential productivity of all tracts of land. Furthermore, most of our water problems are tied closely to the soils of the areas where the problems exist.

I have consciously used the word "soils" to emphasize that we have a great many kinds—probably 70,000 or more in the United States alone. Each of these has a unique set of characteristics, unique history of formation, and many of them a different pattern of potential behavior.

Some soils are suited to only one use; but most soils used by farmers can be treated successfully in several different ways. One of our principal jobs in assisting cooperators in soil conservation districts and other land users is to explain just what these different ways are. We must warn specifically against systems of use that allow soils to deteriorate. We must explain systems that will help conserve and build up soils to assure greater permanent productivity.

In helping land users, we must show them what kinds of soil they have on their farms and ranches and how these soils respond to various types of use and treatment. For this a soil survey is essential. A good farm or ranch plan begins with a soil map and up-to-date knowledge of how the soils shown on the map behave.

One of the first objectives of our

soil survey is to have the many different kinds of soil uniformly named in a national system, so that the same kinds of soil everywhere are given the same name. We can assemble and classify results of research and of farmer experience with different kinds of soil only if the soils are uniformly defined and named.

A system of land use that gives good results on one kind of soil may give very bad results on another kind, even on the same farm. Through soil classification, and its interpretation in light of our current research and experience, we can suggest up-to-date alternative uses for the various kinds of soil. We can and do group many of the different soils into what we call capability units whereby all soils of the unit have similar risks and limitations for cropland agriculture and hence may be used and treated in much the same way. Then, for general planning, we group the capability units into capability subclasses, and capability classes. With this system of classification we can readily determine from a soil map precisely which uses and treatments are adapted to any given field.

Thus our soil survey—soil map and descriptions and interpretations of the soils—serves as a bridge between our great body of soil science and technology, on the one side, and the individual fields and farms, on the other. We are able to apply modern soil science and technology to specific situations

with accuracy and dispatch.

The farmer or rancher must make the final decisions as to the uses and treatments applied to the land he operates. But it is the duty and responsibility of SCS technicians to point out the acceptable alternative uses and recommend the combinations of treatments compatible with the science of soil and water conservation. Then landowners can be assured that the system selected is always within the capability of the soils and is conducive to soil improvement and good water management.

Besides helping to select productive, conserving systems for farms, soil surveys also help to guide the management of ranches and forests. They serve engineers who build airports, highways, housing developments, and other structures on various kinds of soil. They provide a firm basis for the most effective planting and managing of "greenbelts" around and between our cities—areas that can avoid the evils of either urban or rural slums.

We hope and we believe that our present soil surveys are accepted by nearly everyone as non-controversial, objective assemblies of scientific facts. Of course, we expect that people will interpret some of these facts differently. Though new technology is continually changing the relative value of some of our soils for different uses, the Service will continue to try to guide people to select uses for their soils that will permit those soils to be maintained and improved.

Soil Surveys Furnish Basic Data For All Land Uses

By Roy D. Hockensmith

SOILS differ from one another just as people differ. Some have a high potential for production, while others have varying degrees of limitations. Some of these limitations can be corrected; we simply have to recognize and live with others.

In making soil surveys, soil scientists determine the characteristics of soils by both field and laboratory studies. They determine the thickness of the soil, its texture, structure, color, and acidity or alkalinity. They also study other characteristics, especially those having to do with the behavior and potential productivity of the soil as a whole, such as slope of the

soil surface, significant losses by erosion, stoniness, salt accumulation, and evidences of imperfect drainage or flooding. From a study of these many characteristics the soils are classified and named. Each kind is indicated by an appropriate symbol on the map and in legends.

From these observations, supplemented in some instances by laboratory studies, they estimate permeability of the soil, erosion hazard, and other qualities important to the use of each kind of soil.

While making a survey, the soil scientist collects soil samples by soil horizons to be studied in the laboratory. For most analyses loose samples of about a gallon from each horizon are satisfactory.

In the laboratory a scientist measures particle-size distribution to help estimate the water-holding capacity. He measures the rate that water moves through the soil. He studies samples of soil to learn the distribution of certain important minerals.

These laboratory studies make it possible to use the information available on one soil for predictions about other soils with similar characteristics and qualities. At the same time they reveal information that helps in using all the soil information. For example, tests on water-holding capacity may open up new possibilities for the irrigator; or the rate of water movement through the soil may help in planning a tile drainage system.

Where information is needed for highway construction or other engineering uses, 30-pound samples are taken. These provide enough soil for mechanical analyses and other tests to determine engineering properties of the soil.

To give technical soil assistance for some purposes, such as designing drainage systems, deep borings must be made. Checking foundation material on which to build heavy structures or highways and checking the porosity of deep layers that may cause a pond to leak are other examples of special purpose determinations.

To extend information obtained on one soil to similar soils in other areas requires soil correlation. One of the immediate purposes of soil correlation is to assign names to

Note:—The author is director, soil survey operations, Soil Conservation Service, Washington, D. C.



A hole dug with a spade permits the soil surveyor to study the undisturbed soil profile.

the soil units shown on the maps. These, of course, must be consistent with and fit into the nationwide system of soil classification; that is, the name of a soil in a given area must be the same as for soils in other areas that do not differ importantly in properties significant to its genesis and use.

Information about how soils respond to different kinds of management and treatment is gathered from many sources. Farmers' experiences and field trials provide much information. More precise information is gained by experiment stations and other laboratory and field experiments where tests are made under controlled conditions. As information is collected on one soil or on a group of related soils, it can be projected to other similar soils.

Because there are so many kinds of soils and problems, many kinds of soil interpretations are needed. Most users of soil surveys also want more general information than that given about the individual mapping units. They like to have soils that behave alike in response to management and treatment for specific uses grouped together. By introducing the reader to the map, such groupings result in wider and more efficient use of most surveys.

The land-capability classification is one interpretative grouping. It helps to introduce agricultural users to the detailed soil map. Soils are grouped according to their adaptability for common farm crops under permanent agriculture, to what they can be expected to do, to their limitations for sustained production, and to the risk of soil damage if they are mismanaged.

In this classification the individual mapping units are first grouped into capability units. The soils in any one capability unit have similar risks and limitations for agricultural use, respond to the same broadly defined practices, are adapted to about the same farm



Soil samples are taken for laboratory testing.

crops, and return about the same yields under comparable systems of management. Thus, the capability unit is a basic management unit for common farm crops.

Capability units are grouped into capability subclasses, a grouping that suggests both the degree and the kind of problems that a farmer

or rancher will encounter in long-time use of the soil.

Capability subclasses, in turn, are grouped into capability classes, a grouping that expresses only the degree of limitation and risk for agricultural use.

This interpretation is widely used in giving technical assistance to farmers and ranchers through soil conservation districts. Soils are also grouped for special crops, for range sites, and for woodland suitability.

Although most people dealing with land may use soil surveys, the primary use of soil surveys is to help farmers plan their operations. Soil surveys are used particularly by technical people and others who advise and give farmers technical assistance.

With a soil and capability map of his land, a farmer has the opportunity to add greatly to his own knowledge about his soils. A soil conservationist uses the soil map to help him make a conservation plan.



Laboratory testing is done to determine the clay content and other characteristics of soils that are not readily determined by field studies.

Let's take, for example, the 26-acre area on the farm illustrated below. This area consists of two soils that have been given symbols 30C2 and 36C2. Both occur on C slopes (6 to 12 percent) with moderate erosion. The soils, Downs silt loam and Fayette silt loam, are well drained and water moves through them easily. Downs silt loam was developed under mixed grass and tree vegetation; the Fayette silt loam was developed under forests. The Downs silt loam is slightly higher in organic matter and a trifle more fertile. It has a thicker surface soil and a slightly more friable subsoil than Fayette silt loam. But the soils are enough alike for most agricultural purposes that they belong in the same capability unit. They are suitable for growing all field crops common in the area. Since the soils can be used safely for cropland with appropriate conservation practices, they are placed in capability Class III. These soils have high potentials for crops if runoff is controlled and soil fertility maintained.

If used for cropland, these soils can be managed in several ways. With no special conservation prac-

tices other than maintaining adequate fertility, a four-year rotation of small grain and three years of hay could be used. If tilled on the contour, a year of corn can be included and a five-year rotation of corn, grain, and three years of hay would suit. Stripcropping permits using a three-year rotation of corn, grain, and hay. Terracing permits a five-year rotation of corn, corn, grain, and two years of meadow. Any of these combinations would control runoff and hold soil loss from erosion down to less than four tons per acre per year, an allowable loss for these soils.

Other alternatives may be considered. If the farmer wants to use this field for pasture, he can choose from two or more kinds of pasture management, depending on how they suit his needs. The same principle applies if he decides to use the area for woodland.

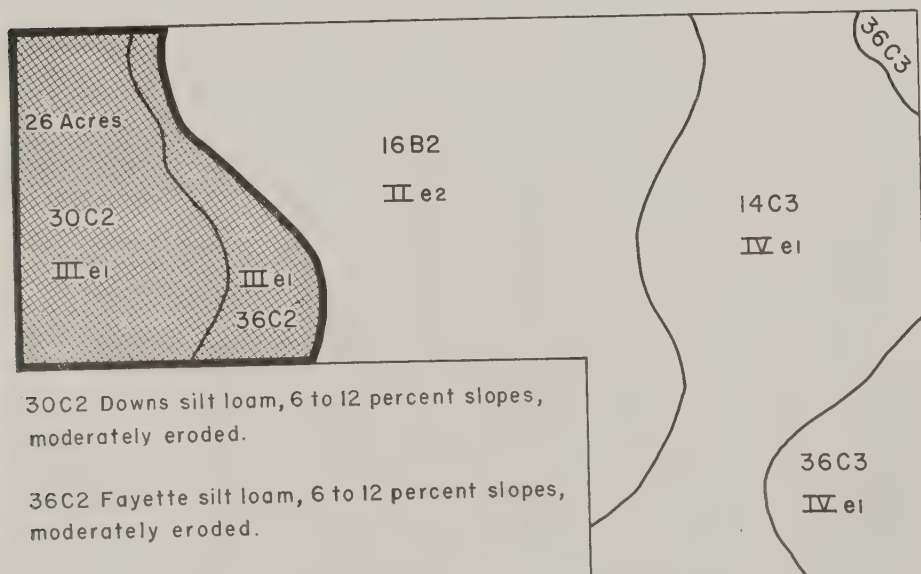
Thus, the soil survey information forms the foundation for a series of decisions the farmer or landowner makes. The specific crop adaptations and estimated yields under alternative combinations of practices give him the basis for a decision. Then alternative ways of managing and protecting the soil

while in any chosen use are pointed out.

The farmer may then make a choice based on his preferences, needs, and how the use for this area fits in with the use and management of the entire farm or ranch. When this procedure has been carried out for all the different soils on the farm, and the uses of each related to the whole economic unit, a conservation farm plan has been made.



The potential capabilities of most range sites are determined by the soils.



There are 5 different soil mapping units on this farm, but the 2 mapping units at the left fall in the same capability unit, IIIe¹.

Soil information also is valuable to the rancher. Soils are grouped into range sites. For example, deep, well-drained soils located in valleys are often the best for production of range grasses, and thus are grouped together for ranch management purposes as valley range sites. Deep upland soils are grouped together as deep upland range sites. Shallow upland range sites include soils that are shallow and somewhat droughty, and so on.

Land appraisers have found that soil surveys are useful not only to estimate land values for individual tracts, but also to provide common standards for an area. For example, the tax assessor for Polk County, Iowa, revised the tax base

in 1952 after a soil survey for the entire county had been completed and interpreted. The county shared the cost of the mapping in order to speed up the work.

Since corn is the main crop in Polk County, it was decided that corn production would be used as the basis for determining a value for each tract of land. Soil survey information was translated into earning power through a system of corn suitability ratings. Iowa State University and USDA scientists helped develop "corn suitability ratings" based on known performance of the different soils. Ten grades of corn suitability ratings were established. Muscatine silt loam, for example, produces 60 bushels of corn per acre with average management and was given a grade of 1. Thurman Sand produces about 25 bushels with the same level of intensity of management (although a somewhat different combination of practices is suited to the soil) and was given a grade of 8. Other soils were rated in the same manner. Every tract of 40 acres was given a grade. These grades were given according to output (harvest) over input (materials and labor), with average or normal management for the soil.

The assessor of Polk County reports that he had only one protest from a farmer taxpayer in 1954 (based on 1953 assessment), and it concerned the buildings. In 1949, under the old system, more than 1,500 protests were filed by farmers. Many other counties also have used soil surveys in appraising land for tax assessment.

County and community planning officials are finding soil surveys of increasing value in helping to deal with the so-called "Urban Sprawl." Soil surveys show the areas which are most productive for agricultural products and thus may be needed in the future for a fast-growing population. They



Soil texture is determined largely by feel to an experienced soil surveyor.

show areas that are less desirable for agriculture but may be just as suitable for houses, schools, supermarkets, parking lots, and industry. With this kind of information, planning officials can help direct non-agricultural expansion onto less productive lands and thus help protect the food production base.

Soil surveys are being used in-

creasingly for planning urban and suburban areas. The engineering interpretations dealing with the suitability of the soils for use in and support of roads, buildings, and other structures and for absorbing effluent from septic tanks are becoming more widely used.

Where soils are evaluated as foundations for structures, their texture, compactness, and moisture content are of outstanding importance. The position of the ground water table and depth to rock likewise cannot be overlooked.

The first step in designing subsurface sewage-disposal systems is to determine whether the soil will absorb septic tank effluent readily and, if so, how much area is required.

Because of the nature of his work, the engineer needs information not only about the soil, as the soil scientist knows it, but also about the material that lies below the soil. Actually, to many engineers "soil" includes all the unconsolidated material that may be moved by earthmoving equipment and usually extends from the



A 42-inch power probe, mounted on a light truck, is used to get undisturbed soil samples rapidly. The open "window" of the probe permits the soil surveyor to check texture, structure, consistence, and color of any part of the profile.



Soil maps and descriptions were used to find out about the soils and underlying material in constructing the Kansas Turnpike.

surface to bedrock. Where the depth to bedrock is more than about 6 feet, the engineer ordinarily finds the information in most soil surveys quite general, but even such general information frequently is useful.

Engineers need such information about soils as grain-size distribution, water-holding capacity, water intake rate, optimum moisture content, maximum dry density, liquid limit, plastic limit, plasticity index, shrink-swell potential, depth to rock, wetness, and drainability. They also need to know the erodibility of soils in order to plan safe water disposal along a highway. And they need to know about growing grass on banks and fills.

While engineers make use of the soil scientists' classification of soils, they have also developed their own systems for classifying soil materials. Their systems are oriented exclusively for construction purposes. Two are used rather widely. In both of these, the soil materials are classified on the basis of three properties—grain-size distribution, liquid limit, and plasticity index. These properties are now known or can be estimated for soil layers in profiles representative of many of the soil scientists' soil types. By indicating what the soils are, layer by layer, in each of the engineering systems, more engineers

are making better use of the soil scientists' soil surveys.

The conservation engineer also has many uses for soils information. For example, he needs to know how fast water enters the soil (intake rate) and how rapidly water passes through the soil. He needs such information in order to lay out terraces, irrigation and drainage systems, and to determine the size of flood-retarding dams.

Foresters and woodland conservationists are learning a great deal about the relationships between different kinds of soil and wood-crop production, as well as related soil-use values, such as for watersheds, recreation, and wildlife. This information is especially useful when the relationships of the different soils are presented by grouping the soils that behave alike in response to management and treatment for specified woodcrops. In the newer soil survey reports these are presented as Woodland Suitability Groupings. Each such soil grouping is evaluated for different items of use and management so as to give "leads" to the choice of adapted species, information about potential productivity, and the best combination of conservation practices needed. Soil conservationists and other technical personnel use this information

in giving assistance to woodland owners or operators.

Wildlife conservationists find soil surveys helpful in planning and developing measures for protection and improvement of wildlife habitat. Some soils are well suited to this use but to no other. A survey may be used for evaluating habitat, locating and building ponds and dugouts for waterfowl, and in locating recreation, hunting, and fishing sites.

Other groups representing a variety of interests need information that soil surveys provide. The Soil Conservation Service and State agricultural experiment stations give this kind of help where possible and encourage the groups themselves to employ soil scientists to help with this kind of work.

In recent years planners for large metropolitan areas have found soils information to be vital to the job they are doing. Fairfax County, Virginia, is an example. So great has been the demand for soils information for a wide range of uses, including location of roads,



Oil and gas companies use soil surveys to determine routes of pipelines.

septic tanks, shopping centers, schools, foundations for large buildings, underground utilities, and other uses, that the county supervisors appropriated money to help complete the soil survey and hired a soil scientist to work with local people. The soil scientist devotes all his time to interpreting the soil survey for the various government agencies and citizens of the county.

Oil and gas companies use soil surveys to plan the routes of pipelines where corrosion will be least and to plan for erosion control after they are installed.

One gas company in Nebraska has been working with soil scientists for over 20 years. They not only got information that helped them in locating the line but also encouraged many farmers to practice soil conservation where the pipelines were endangered by erosion. Telephone and power companies who lay underground lines have similar need for soil information, especially on the depth to rock.

Food processors and canneries want to locate their plants where they can be assured of a reliable source of raw materials. Is there enough land with soils suitable for growing tobacco, sweet corn, peas, strawberries, tomatoes, or soybeans? Soil facts help provide the answers.

Investors, banks, insurance companies, and building and loan companies find soil surveys helpful in determining the soundness of proposed investments in land. Manufacturers of earthmoving equipment need soils information in the design of certain types of machinery.

Various soil conservation, watershed conservancy, and drainage districts have need for soils information in making district plans and in developing district programs. A detailed soil survey actually forms the foundation for a



Soils information was used in designing this irrigation canal, especially to determine which sections should be lined.

soil conservation district's program of work by showing where the most urgent work is needed and what kind of program will be most beneficial.

Although many of the ordinary uses of soil surveys are also found in watershed activities, some of the uses peculiar to watershed work are: (1) They serve as a basis for the delineation of plant-soil groupings which the hydrologist uses to estimate rates and amounts of storm runoff; (2) they provide one of the bases for computing sedimentation rates, rates of delivery, trap efficiencies of reservoirs, etc.; and (3) they serve as a basis for estimating the suitability and productivity of the floodplain when flood protection and drainage are provided.

Research workers in experiment stations use soils information to set up crop and fertilizer studies. Extension workers and teachers use soil maps to help show farmers and students how to do a better

job of farming.

The findings of a soil survey are published as a soil map and a printed text that describes each of the soils, summarizes what is known about them, and explains their potential uses.

Most of the present reports are written primarily for agricultural users of the map. Most of them include additional information of value to engineers, foresters, geologists, land appraisers, and others. Since they report basic soils information, other interpretations for specific purposes can be made from them.

If the units on the map are properly described, the survey can be interpreted and reinterpreted as economic or other conditions change. Since yield predictions and management recommendations from a soil survey depend upon both the soil and the state of the agricultural arts, the development of new technology usually requires new interpretations.

A Realtor's Views About Soil Surveys

By Verlin W. Smith

MY first contact with a soil survey party was in July 1949, while seeking information about a farm in Loudoun County, Virginia. That was the beginning of my practical education about the use of soils maps in the real estate business, whether it be a farm, rural acreage, suburban housing development, or individual homesite that is involved.

Previously, I had received a B.S. degree in agriculture from the University of Maryland, with agricultural education as a major. My course of study included many agricultural subjects, with some courses about soils. But it did not provide enough information about how soils information—and especially good soils maps—may be profitably used by nearly all farmers, ruralites, and urbanites. Since learning the importance of soils and the differences in the quality of soil maps, I have tried, in my professional capacity, to pass on this information to clients who buy or sell land. I also have spent a great deal of time trying to show professional colleagues the value of using good soil maps in their real estate transactions.

The general welfare of every taxpayer and freeholder is affected by his, his neighbors', or his government's improvements on the earth's surface. The preamble to the code of ethics of the National Association of Real Estate Boards states: "Under all is the land. Upon its wise utilization and widespread ownership depend the ad-

vancement of national well-being and the perpetuation of the free institutions that go to make the American way of life." Under our free enterprise system, ownership of real property has reached the widest distribution known in man's history. The stability of this ownership would have been greatly improved had we given more careful consideration to soils.

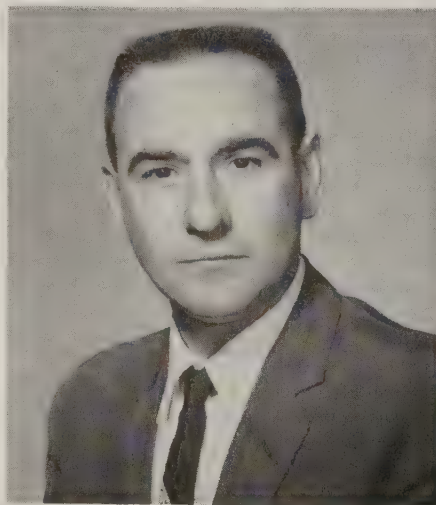
The real property of the Nation consists of land and improvements on land. Most businessmen, homeowners, or other dealers in real property have little trouble in properly assessing the value of the improvements on a tract of land. But it is surprising how many of them have largely ignored the actual value of the land itself, even though an up-to-date soil survey could be purchased for a few cents

that would give them the basic information needed to properly evaluate the land.

From my experiences over the past 10 years, I am convinced that up-to-date soil surveys furnish information that is fully as important to rural and suburban developments as it is to farmers. In some instances it can be much more important, because the value of the improvements to be placed on the land is so much greater. It seems to me that such surveys should be carefully studied by all planning commissions of every jurisdiction. And I find that many county and community planning commissions are using such surveys—are beginning to take a look at what is beneath the surface of the ground in making their plans for the future. Unfortunately, too many are not doing so.

I have found that some of the older soil surveys, especially those completed more than 25 or 30 years ago, do not give as much detailed information as might be desired by suburban or rural planners. But even these older surveys furnish much basic information about soil types that is of considerable value in appraising farmland, and may have much value to the average ruralite or suburbanite if he will get a soil scientist or other qualified person to interpret the information. And the newer surveys, especially those made during the past 5 or 10 years, give a wealth of information to almost anyone interested in ap-

Note:—The author is vice president of a prominent real estate firm in Washington, D.C.



Verlin W. Smith

praising land for almost any purpose, if he but takes the time and trouble to study the maps and the discussions on the characteristics and limitations of the various soil types.

Since all taxpayers contribute toward the cost of soil surveys, it was difficult to understand why the soil maps were locked in the county agent's desk drawer of one county in Virginia, when I sought to use them a few years ago. The agent in this county had worked many years to obtain a good survey and was an enthusiastic user of soils information. He had seen the "hammer fall" at many foreclosures, and seen numerous disappointed city farmers and others who had failed to investigate the soil when they purchased land. Yet, he told me that the soil maps could not be used by realtors unless they received written permission from the owners. The reason, as I recall, was that shortly after the soil survey was completed a prospective farm purchaser told a farmer that he would buy his farm if the soil was of as good quality as had been represented. This prospective purchaser checked the soil maps, which showed that the soils were inferior. When the deal failed to materialize, the property owner filed suit against the county agent and governing body. After this fiasco the soil maps became "restricted" information.

I found that owners of good soils in this county usually were willing to give written authority for a realtor to use the maps, but that persons who wished to sell inferior land were not so inclined. Many of the farms falling in the latter classification may be referred to as "hot farms" because they usually change hands frequently.

What appeared to be a difficult situation in this county led to the wisest investment I believe any realtor selling land can make. Through the Virginia Agricultural

Experiment Station and U.S. Soil Conservation Service, the real estate firm with which I am associated was able to purchase complete sets of soil survey maps for most counties in which we transact business. Of all the maps and numerous other sales materials available, if I were limited to using just one item in the sale of land for either farming or urbanization, I'd prefer the soil map. The cost to one office or individual in acquiring such valuable information would be prohibitive; but since the maps are available at such a reasonable price, I know of no other way to buy the work of experts so cheaply.

I recently used two sheets of a soil survey map, which were made on 1937 aerial photos, for an appraisal of a farm. When I glanced at the photos while inspecting the farm, it was almost like waving a red flag at a bull. The prospective seller didn't like it a bit, because the soil maps immediately revealed why the cultivated fields had receded from the timberline during the past 20 years. The map showed stony, shallow land on D and E slopes (20 to 40 percent)—an impossible situation for mechanized equipment and \$1-per-hour labor. This and other information were used to negotiate a purchase at a realistic price.

Our able and wide-awake county agent in Fairfax County, Va., was quick to recognize an opportunity to get a soil survey as part of a master zoning plan. Several years ago a planning consultant from New York told the county board that the outdated 1915 soil map was inadequate for proper planning, especially in locating flood plains. A recent consulting engineer's report bears out this contention. It states that 6.9 million dollars will be necessary to correct damages which occur to houses on only two of the several flood plains of the county.

The Board of Supervisors of Fairfax County, faced with a multitude of problems created by a population increase from 40,000 in 1940 to 100,000 in 1950 and estimates, since confirmed, of over 250,000 by 1960, contracted with the Soil Conservation Service and the Virginia Agricultural Experiment Station for an accurate and detailed soil survey. The county paid a substantial part of the cost to get the survey speeded up. It was three years in the making, and before completion the demands upon the soil survey party for soils information were so great that the survey was delayed several months. Since then the county has hired a full-time soil scientist to interpret the survey information. His services have saved the taxpayers millions of dollars.

After the soil survey was completed in Fairfax County, I had the misfortune of learning firsthand how adversely an accurate and detailed soil survey can affect real estate values, and also affect one's financial statement and ego. After I left the Marines at the end of World War II, my wife and I purchased 70 acres in this county, 21 miles from the White House, as a combination homestead and investment. We had planned eventually to sell homesites along the road frontage and were pleased to have an increasing number of inquiries for sites as urbanization moved closer. A study of the soils map, which incidentally is furnished free to anyone in the county, revealed that none of the soil near the road would pass percolation tests. Any homesites will have to be from 500 to 1,500 feet from the road and a stream, with an uncomfortably wide flood plain, will have to be bridged. This land today probably would bring \$750 per acre, whereas better land with similar topography, road frontage, etc., would fetch \$1,500 to \$2,000 per acre. Needless to say, our next

land purchase will be based on what is underneath the surface.

During 14 years of handling the sale of farms and acreage, I have observed and heard of hundreds of instances where the use of soils information could have prevented serious and often expensive mistakes. A few follow:

A school board purchased 25 acres as a site for a high school at a cost of \$20,000, designed the building, and let the contract for about 1.3 million dollars. The builder encountered poor footing conditions and renegotiated the contract for stabilizing the foundation. This cost was more than \$230,000 above normal cost—enough money to pay for 3 soil surveys of the entire county, to hire a county soil scientist for 23 years at \$10,000 per year, to build a much-needed eight-room elementary school, or to reduce the tax rate for the entire county by 10¢ per \$100 assessment. A study of the soils on the site later showed that the building could have been constructed on solid ground a few hundred feet away.

A school board purchased a site and built a school on impermeable soil, and constructed a conventional

septic tank and drainage field. When the drainage field failed, a sand filter was constructed. When the sand filter failed, a 4-inch ditching tile was run between the filter and a nearby stream.

A county floated a large bond issue to eliminate health hazards caused by 2,000 overflowing individual septic tank disposal systems.

The Federal Housing Administration refused to insure loans on approximately \$2 million worth of homes under construction or built in one area because the soils were unsuitable for individual sewage disposal systems.

Three apartment buildings were abandoned and windows boarded over in one community because of serious cracks in walls and foundation—apparently the result of poor underlying soil.

Approximately \$7,000 was spent to stabilize the footings under one tower for a high-tension electric line after construction of the line.

In one county, hundreds of homes have wet basements and cracked walls, and many miles of roads are full of potholes and cracks because they were built on soils with high water tables or high expansion potentials.

Volumes of printed material are available on the 6-penny nail, a southern pine two-by-four, clay products, or almost any kind of building material you wish to mention. But pitifully little information is available on the building site potentials of the approximately 7,000 series of soil that have been identified, described, and mapped in the U. S.

The Federal Housing Administration, Soil Conservation Service, Virginia Polytechnic Institute, and Bureau of Public Roads are to be congratulated for their forward step in this respect by furnishing data for and publishing the F.H.A. Manual No. 373, titled "Engineering Soil Classification for Residential Developments."

Since soil is the most widely used building material and all improvements rest on it or parent rock, and since relatively little is known about it, every effort should be made to expand such cooperation. Use of accurate and detailed soils information could doubtless reduce the cost of homes, roads, and all other manmade structures, as well as the cost of food and other necessities that come from our agricultural lands.



A prospective buyer, seller, and realtor check the soil map for land involved in a suburban development.

By Reservation Only

By R. W. Eikleberry

THE farmers of Geary County, Kansas, have a modern soil map and soil survey report. They know how to use it, too.

Geary County is not very large; there are only about 500 farms in the county. But over 600 men, women, and children were on hand for the four meetings held in Geary County to receive their copy of the Soil Survey Report.

Mike Stroud, county agent in Geary County, organized the meetings; and Mike knows how to organize and carry on a meeting when he has something of benefit to his farmers. He doesn't just announce a meeting and put a notice in the papers. You have to have a reservation to come to his meetings or you don't attend.

The farmers know that when Mike has a meeting he has something that will help them. Every detail is planned in advance, and Mike doesn't do all the work, either. The 4-H Clubs, Home Demonstration Agent, County Farm Bureau, soil conservation district supervisors, the farmers and their wives all have a job to do; and they all did their job well at the meetings I attended.

When the meetings were scheduled, there were committees for food, water, and seating—they had portable bleachers—entertainment for the children, wood cutters, a public address system, and even portable rest rooms.

Willard Bidwell, professor of

soils at Kansas State University, had prepared for these meetings in advance. The farmers and their wives and children didn't have to chase through tall corn, waist-high bluestem grass, or dusty stubble fields to look down into a hole at the soils. Willard brought the soils to the "meetin'" place. He had a mounted profile of each of the 19 main soils of the county. He used the profiles to explain soil mapping units, erosion, depth, texture, inherent fertility, and just how a soil scientist makes a soil map.

Elmer Betz, the SCS work unit conservationist, had prepared large soil and capability maps and land use maps to explain how a tailor-made farm or ranch plan is made to fit the farm and the farmer. He used the maps to explain land capabilities, range sites, and how the landowner chooses the practices to fit the land. He explained that he was there to help them choose, from a number of alternatives, how they could best use their land within its capabilities and treat it according to its needs. Elmer also had done some real advance planning. Over a year ago he had put out over 20 grass variety test plots on the Gaylord Munson farm. These were located just up the road from the meeting place in Mr. Munson's well-kept farmyard. Grass is a crop in Geary County. There are about 30,000 head of cattle here in an average year. So, the farmers want to know about the best kinds of grass and how to manage them for more pounds of

beef—more dollars for their labor. Here on these test plots, Elmer showed them that some grasses were better on this particular soil than others.

I looked at my watch and thought it was getting late. It was nearly nine o'clock at night, and the meeting had started officially at six. I glanced around, but no one was leaving. Mike Stroud knew what he was doing. He introduced Bob Bohannon, Extension agronomist from Kansas State University. Bob did not really need an introduction. He had been there since one o'clock in the afternoon, and by this time he could call most of the farmers by their first name.

Bob didn't just talk to the men, either. As the women gathered here and sat on the edge of the bleachers, he talked woman-talk to them—money. How could they get that new stove, deep freeze, curtains, linoleum for the kitchen, or maybe a new dress to wear to church on Sunday? Would they be able to send that little boy or girl of theirs to Kansas State University? When he told them about more wheat in the bin, more hay in the stack, more corn in the crib, or more fat on a steer, they knew that he was talking their language.

Bob explained to them that crops were just like cattle and chickens. They each require a different diet. He showed them crops grown in the greenhouse on soils collected in Geary County. He explained how a balanced fertilizer program based on soil tests would increase their crops.

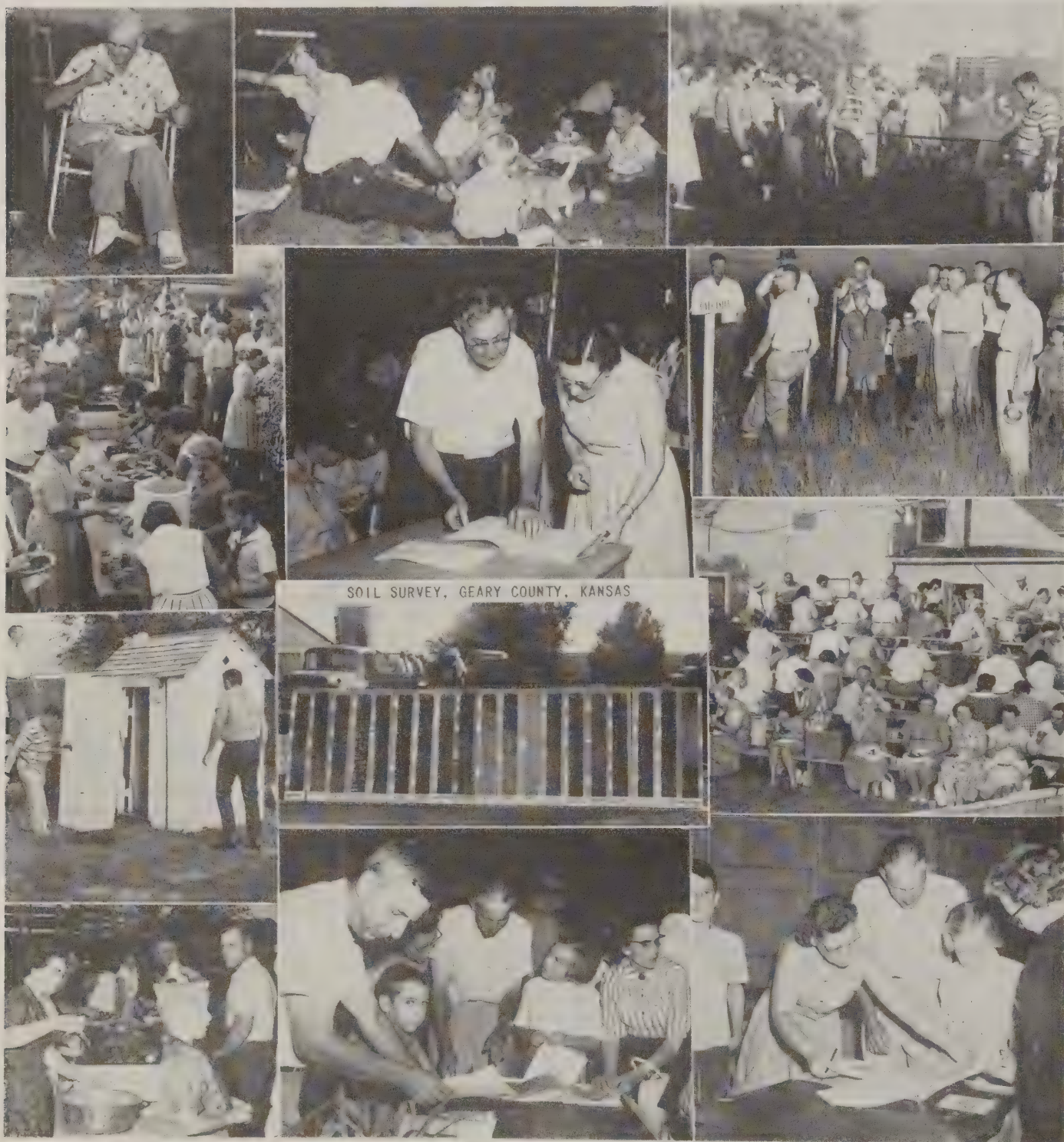
Note:—The author is correlator for soil interpretations, Soil Conservation Service, Lincoln, Nebr.

Bob had done some more planning, too. Back in May he had put out fertilizer demonstration plots on corn within 200 feet of the beautiful farmyard of Wayne Upham, the meeting place the first evening. Here the farmers and

their wives and children could view the results from on-site demonstrations. Some of that corn will go over 100 bushels per acre—"dryland."

At 9:30 I thought surely some of them would slip off and go

home; but they didn't. These people came to learn. Large tables were set up under the lights, and each family was given a soil survey report. The men in charge had trained some helpers to assist each family to locate and outline their



They came to eat, listen, look, and learn.

farm on the soil map. They showed them how to read the mapping units, find the soil descriptions, capability units, management and erosion control practices, and the adapted crops or range sites. Yes, even the farmer who had broken both legs the week before in a tractor accident and had to come in a wheel chair, knew how to use the soil survey report of Geary County.

The meeting was over by 9:45 on the Munson farm; but the people still didn't go home. They gathered around the agricultural workers who had come there to help them learn about their soils. They asked questions and gave opinions. By 10 o'clock, the bleachers, tables, water tank, soil profiles, barbeque pit, and portable rest rooms were on large grain trucks ready for transport to the Shirley Janke farm, 15 miles southwest. The show must go on. It would be a different group down in the Flint Hills part of the county tomorrow. There it would be mostly cattlemen with large ranches; but these ranchers know that they can't afford to stay at home; not when Mike Stroud and Elmer Betz invite them to come by reservation only.

Within the coming year, Kansas will have five more of these modern soil survey reports. You can be assured they won't be left in a storeroom to collect dust if Bohannon and Bidwell stay around. While it is only a one-time affair with the men in each county such as Mike Stroud and Elmer Betz, with Bohannon and Bidwell it will be five more stands and they will play to full houses of interested, hard-working farm families.



During the past decade, the number of farm tractors in the world has increased by some 70 percent; in the same period, the horse population dropped 7 percent.

Building Soil With Grass

By Roe D. Crabtree

PLACE a carpet of prairie sod over the top of the Palouse hills. Give it centuries to develop a fertile soil layer. Break it out with a plow and cultivate it for 50 to 70 years and you have the present-day Palouse country farmland of eastern Washington.

In this relatively short period of cultivation, erosion has moved many tons of topsoil down the hills so that from a fourth to a half of the original topsoil is no longer in its proper place; the clay subsoil on the ridges and points of the hills is exposed.

The soil has lost much of its former "bounce" and needs to develop some of its former structure

that has been broken down by tillage. It needs a chance to get back on its feet so it can continue to withstand the rigors of present-day use.

The Palouse soils are built on a deposition of silt up to 200 feet in thickness overlying the Columbia basalt flows. This deposition was blown from the dry basins to the southwest and heaped into hills which were elongated from the southwest to northeast and reshaped by running water and geologic erosion.

Larry Lothspeich, a conservation farmer and supervisor of the Central Whitman Soil Conservation District, is reconditioning some of his land by seeding alfalfa and grass. The hillsides were seeded to

Note:—The author is work unit conservationist, Soil Conservation Service, Colfax, Wash.



Larry Lothspeich examines the heavy stubble left from a 70-bushel wheat crop to decide how best to use it in his conservation farming program.



Greenar intermediate wheatgrass and alfalfa, uncut for 4 years, blanket the steep hillsides, while alfalfa and orchardgrass, cut for hay, cover the gentler slopes on the Lothspeich farm.

a mixture of four pounds of alfalfa and 12 pounds of Greenar intermediate wheatgrass per acre, which has gone unharvested for the past four years. The bottomlands have orchardgrass and alfalfa which is used for hay.

A 79-acre field was seeded about the time the current wheat allotment program went into effect. It includes some very steep slopes, clay ridge tops, "eyebrows," and also some relatively flat bottomland. This stand will be left in the grass legume cover for 5 or 6 years, at which time it will be broken out except for the very steep slopes.

Grasses and legumes play an important part in the restoration and maintenance of soil. They can be seeded alone or in mixtures, and utilized for forage, seed, erosion control, or soil improvement. This is especially true of the perennials that are allowed to grow for several years. A good stand protects the soil against erosion, builds soil structure, increases productivity, and improves the biological life.

Greenar intermediate wheatgrass is high in root production. By the end of four growing seasons at Pullman, Wash., Greenar had produced 7,424 pounds of root material in the top 8 inches of soil.

Greenar is a mild sod-former. It is easy to establish from spring plantings, has excellent seedling vigor, and gives a dense, leafy ground cover the first year. It makes a good mixture with alfalfa, reaching the hay stage at least two weeks later than alfalfa, making a better quality mixed hay. Greenar begins growth in early spring and reaches pasture readiness about the same time as alfalfa. It makes good growth in the early fall so that ground cover is maintained over winter.

The past cropping history for this part of the Palouse country has been black fallow and wheat, with barley, oats, or peas as secondary crops. This system of farming tends to decrease the organic matter level and increase the hazards of erosion.

The soil conservation districts in

the Palouse country are working with the Soil Conservation Service and other agencies in developing alternative systems of land use that will maintain productivity and reduce erosion and at the same time be profitable. It has been found that cropping systems using alfalfa and grass in rotation with grain crops or continuous grain plus nitrogen with full utilization of crop residues are satisfactory for organic matter maintenance and erosion control.



Weed control is important. Experimental results from experiment stations in the North Central States show that one plant of yellow mustard uses twice as much nitrogen, twice as much phosphorus, and four times as much water as a well-developed oat plant. A common ragweed uses three times as much water as a corn plant. One lamb-quarter in a hill of corn reduces the yield by one-third. The earlier these weeds are killed, the less depressing the effect on the yield.

Of shoes, and ships, and sealing wax, and—

A Lot About Snow

By Tarleton A. Jenkins

AT a snow conference, folks talk about as great a variety of subjects as the walrus and the carpenter. All of them, of course, about snow.

Snowpack management, snow surveying, avalanche control, short-cutting the snow survey job, reducing evaporation—that's a sample of the topics.

At the Western Snow Conference in April 1960 at Santa Fe, N. Mex., the 100 or more delegates talked about all of these things

Note:—The author is information specialist, Soil Conservation Service, Denver, Colo.

and many others. They brought snow surveying up to date in the electronic age, going into the use of electric pulses to indicate snow depth, air temperature, snow quality, and soil moisture. They talked about the use of electronic computers to digest the thousands of reports and come up in minutes with the needed answers.

The delegates heard a group of U.S. Forest Service men report on what they have learned in trying to guide snow into the best places and to slow down, where needed, its melting rate.

In the group were Henry W. Anderson of Berkeley, Calif.; Marvin D. Hoover of Fort Collins, Colo.; Howard W. Lull of Upper Darby, Pa; and Paul E. Packer of Missoula, Mont. Serving as moderator was Irvin M. Ingerson of California's Department of Water Resources.

The four discussed the effects of the various kinds of forest management on snowpack, melt, and runoff. They told of the use of snow fences and of the effects of thinning or strip-cutting of timber stands on snow distribution.



The variety of interests represented in the 28-year-old Western Snow Conference is reflected by these 15 delegates to the Santa Fe session. From left, they are: Dave Mathias, irrigator, Monte Vista, Colo.; David M. Rockwood, Army Corps of Engineers, Portland, Oreg.; Philip B. Mutz, Interstate Streams Compact, Santa Fe; Robert Bursiel, highway engineer, Girdwood, Alaska; George A. Lewis, City Water and Power Dept., Los Angeles, Calif.; Walter E. Johnson, Washington Power Co., Spokane, Wash.; Francis T. Mayo, State Engineering Dept., Bountiful, Utah; Manes Barton, Soil Conservation Service, Reno, Nev.; Bert Goodell, Forest Service, Fort Collins, Colo.; Wilbur L. Heckler, Geological Survey, Santa Fe; Lee M. Maxwell, University of Idaho, Moscow, Idaho; George W. Peak, Soil Conservation Service, Casper, Wyo.; H. I. Hunter, Department of Lands and Forests, British Columbia, Canada; and Walter U. Garstka, Bureau of Reclamation, Denver, Colo.

Lull, whose work has been in the mountainous areas of the Northeast, pointed out that the problems in his part of the country are related more to flood-inducing runoff than to water supply.

Packer explained that experience with a vast stand of lodgepole pine in the Northwest has furnished clues in the effect of cutting practices on water quality. There may be an opportunity under some conditions to manage the timber harvest to improve the quality of water for downstream users, he said. His area principally needs management to cause an earlier flow of water and a longer tapering-off period.

Wind characteristics at alpine levels of the western mountains are sometimes surprising, Hoover told his audience, "Snow fences often produce some weird and wonderful effects."

Induced avalanches to store snow in preferred gathering places and the use of artificial ridges are possibilities for the future manage-

ment of snowpack, he reported.

Anderson discussed the behavior of snow under varying conditions—in the snow zone high up, in the forested areas lower down, in areas of brush, and in bare spaces. Removing brush sometimes gives substantial increases in water yields, he said.

Walter U. Garstka of Denver, chief of the Bureau of Reclamation chemical engineering laboratory branch, told the conference that the principles of "monolayer" treatment of reservoir surfaces are sound. A practical, low-cost way of reducing evaporation from reservoir surfaces isn't far off, he said.

The film, six ten-millionths of an inch or one molecule thick, has proved effective in reducing evaporation from large surfaces by nine percent. A 36-percent reduction is a practical mark to shoot at, Garstka maintained.

A Canadian, Peter A. Schaerer of the National Research Council, Ottawa, reported his nation's efforts to protect the new Trans-

Canada Highway where it weaves through Rogers Pass. They have worked up case histories on the treacherous avalanche areas. They will build sheds for the worst, and treat the less troublesome ones with guards and barriers.

M. Martinelli, Jr., of the Rocky Mountain Forest and Experiment Station at Fort Collins, had a most attentive audience for his report on observations of avalanche control in Europe. The French have worked out an ingenious system of nylon nets and earth barriers.

Backdrop for the entire conference scene was the widespread use of water yield forecasting based on the State-Federal snow survey which is directed by the Soil Conservation Service. Throughout the three-day session, speakers referred frequently to its use, to improvements that may be possible in techniques. Arch Work, veteran Soil Conservation Service employee at Portland, Oreg., heads the water forecasting section. He has long been active in the snow conference.

The 1961 conference will be at Spokane, Wash., with Jerry Van de Erve of Sacramento, Calif., as general chairman. Van de Erve is area engineer for the U.S. Weather Bureau.

Better Nitrogen Tests for Wisconsin Soils

Modifications in a soil testing procedure may lead to sharper recommendations for nitrogen fertilization, according to University of Wisconsin soil scientists. Basically, the new procedure is a modification of an older method for determining available nitrogen in soils. The main difference is that the new testing method also takes account of the nitrate form of nitrogen. The older procedure ignored this form of nitrogen, so probably underestimated the amount of available nitrogen in the soil.



Francis T. Mayo (left), chairman of the snow conference, explains the work of a snow survey team to W. A. Williams, area vice President of NASCD.

Snow Survey Forecasts Make the Difference

Between Success and Failure

By Clarence Hedrick

AS early as January 1960, John Pastoor had a part of the story. By April—with planting time at hand—he had the rest: “Water for irrigating Pastoor’s land will be only about half of what he normally receives.” The story was not good news, but it did come in time for him to do something about it.

The word had come from the Cooperative Snow Survey, the annual winter-to-spring checkup by the Soil Conservation Service and participating agencies on mountain snow and its water content. From this survey, Pastoor and his neighbors—as well as cities, power companies, and other water users downstream—could know well in advance how much water they likely would have in the following months.

For John Pastoor and his neighbors, south of Twin Falls, Idaho, the word that the water supply for irrigation would be only half that of normal had this meaning:

They would fit their plantings to the water outlook. For Pastoor it meant that he would plant a portion of his irrigated acres—200 out of the 360 on his farm—to crops that needed less water than the potatoes and alfalfa that he otherwise might have grown.

Pastoor, widely respected in the Twin Falls Soil Conservation District as an irrigation farmer, has 687 shares of water. By using this water with top efficiency—letting a minimum get away in the irriga-

tion process—he ordinarily has enough for his 200 acres under irrigation. He figures 2.5 acre-feet to the acre will give him a maximum yield. (It isn’t uncommon in the West to find irrigation farmers using three times that much to get satisfactory crops.)

For Pastoor, getting along with less-than-normal water was not a new experience. It was much that way in the 1959 irrigation season. The April snow survey report that year showed the water yield would be only .34 acre-foot per share.

That much of a shortage did not necessarily mean a serious problem for Pastoor and his neighbors. It was mighty important, though, that they know in advance of planting time how much water they could expect.

In 1959 Pastoor, using the estimate of the irrigation supply, figured he would have 233 acre-feet of

water for the season. Since he needs 2.5 acre-feet per acre for efficient cropping, he could then figure the acreage he could safely irrigate.

He actually prepared and seeded 103 acres, with 78 acres in wheat and 25 acres in peas. The rest of his land he put in hay and grass, which have relatively low water requirements.

Pastoor’s 1959 estimate of his water needs could scarcely have been more accurate. After the final irrigation he had one acre-foot of water left.

By making sure that he would have the needed water for the wheat and peas, Pastoor had been able to make top use of fertilizer and the water actually available. The wheat yielded 80 to 90 bushels per acre (a splendid yield in any section of the country) and the peas yielded 30 sacks per acre.



John Pastoor in a field of Siberian wheatgrass that produced \$200 worth of seed per acre.

Note:—The author is work unit conservationist, Soil Conservation Service, Twin Falls, Idaho.

The idle land on the Pastoor place got the treatment a conservation farmer like Pastoor would be expected to give it. He used a rod-weeder to keep down weeds and did some additional leveling and shortening irrigation runs. And he used his other spare time to improve his irrigation system still

more by installing concrete pipelines.

Toward the end of the season Pastoor found he could put enough water on a planting of Siberian wheatgrass to get a seed crop. It grossed just over \$200 an acre. This success led him to decide to put in 45 acres more of the wheat-

grass for seed production and plant three acres of Alkar Tall wheatgrass.

In the Salmon Tract irrigation area, it wasn't hard to find examples of costly failures in the 1959 season. In some cases farmers, taking a chance on there being more water available than the forecast indicated, planted their usual acreages in crops requiring ample water. In some instances, there were stands of corn only half matured, potatoes that could not be profitably harvested, etc.

Pastoor's reliance on the accuracy of the snow forecast stems in part from his own efforts in gathering the survey information. With other farmers and ranchers in the district, he works with Walter Hankins of the Soil Conservation Service in making snow measurements throughout the winter. This work has helped him gain an understanding of how the information is processed and used.

There are some 25 other district supervisors and cooperators who have gone up the mountain to make snow surveys. The most consistent group are Supervisors Glen Nelson, Ellis Fuller, Ralph Schnell, and Truman Clark.

"They've been working on this runoff forecasting a long time now," Pastoor said. "The estimates we farmers get on the water outlook are worth a lot of money to us if we are willing to use them. I don't see how any farmer, given this information, can fail to take advantage of it. To me, it is just the difference between a successful farming year and a complete failure. It's not a hard choice for me to make."



Your soil is like a bank account. When you harvest a crop you remove plant food which must be replenished by decayed plants, insects, etc., or by commercial fertilizer.



Planning and planting in line with the water forecast made the difference between these fields of corn. (above) Victor Nelson in a field that received adequate water because some of the land on the farm lay fallow or was planted to grass. (below) A field on a neighboring farm where all the land was planted to crops that have high water requirements.



IRRIGATING GRAIN SORGHUM FOR EFFICIENT WATER USE

By Jack T. Musick

There are nearly 3 million acres of irrigated grain sorghum in the western Great Plains. The primary source of irrigation water is pumping from underground reservoirs.

The western Great Plains has large acreages of nearly level land that can be prepared for irrigation at minimum cost. The water available for irrigation is limited, however, and should be used efficiently and conserved scrupulously to insure a continuous supply. In some areas, pumping has already exceeded natural recharge and has lowered water tables and underground storage.

An important question facing irrigation farmers of this region is when to irrigate to make the most efficient use of available water? A second important question is how many acres to irrigate? Intense irrigation of a small acreage will result in less efficient use of water. Likewise, spreading the water over too large an acreage may result in considerable reduction in yields and less efficient use of water.

An experiment was started in 1954 and continued through 1959 at the Garden City Branch Experiment Station in western Kansas, to study water management of irrigated grain sorghum. The control plots were irrigated four times, once before planting, at 10- to 14-inch plant height, at boot stage, and at milk stage of grain. This

treatment, combined with optimum fertility and good management, approached maximum yields. Treatments were delayed or omitted on other plots to determine how limited irrigation affected plant development and grain yields.

The experiments were conducted on Ulysses clay loam, a typical "hardland" soil of the area. The soil has a deep, moderately permeable profile underlain with loess. Available water holding capacity is about 2.0 inches per foot of depth. The average annual precipitation is 17.98 inches but varies considerably from year to year.

The greatest cause of low grain

No. 59
This is the fifty-ninth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

yields is moisture stress. Low soil fertility, particularly nitrogen, is also a major cause of low yields on some soils.

Moisture stress which greatly decreased yields resulted in inefficient use of water for grain produc-



Grain sorghum grown with optimum irrigation. Plants at left received adequate nitrogen fertilizer, and produced about 62 percent more grain than plants at right, which received no nitrogen.

Note:—The author is agricultural engineer, Agricultural Research Service, Akron, Colo. (formerly at Garden City, Kansas).

tion. Water use efficiency is expressed as pounds of grain produced per acre-inch of water used by the crop. Under dryland production, the efficiency of water use usually ranges from 0 to 200 pounds per acre-inch. In this experimental study, use efficiency of irrigation water ranged from approximately 200 to 400 pounds per acre-inch.

The irrigation water requirement depends on the amount and distribution of rainfall and how fast the crop is growing. The daily rate of water use has a characteristic pattern throughout the growing season. Water use increased from less than 0.10 inch per day for young plants to slightly over 0.30 inch per day during the peak use period, from the time plants start to head until the grain has reached the milk stage.

Irrigation increased grain yields in all years the experiments were carried on, but the increases varied considerably. The average yield for the 5 years was 4,100 pounds per acre from preplanting irrigation only and 6,500 pounds per acre for the maximum yield treatment. Dryland fallow yields during the same period averaged 1,800 pounds per acre. Thus, the maximum yields averaged 360 percent over dryland fallow yields.

Each successive irrigation increased yields less than the previous irrigation. Preplanting irrigation, that wet the soil to a depth of 6 feet, increased yields an average of 2,300 pounds per acre over dryland fallow. An additional irrigation at 10- to 14-inch plant height increased yields 1,610 pounds more per acre. A third irrigation at boot to early heading stage increased yields still another 600 pounds per acre. The last irrigation at milk to soft dough increased yields only 180 pounds per acre. A well-timed irrigation sometimes increased grain yields up to 3,000 pounds per acre and pro-

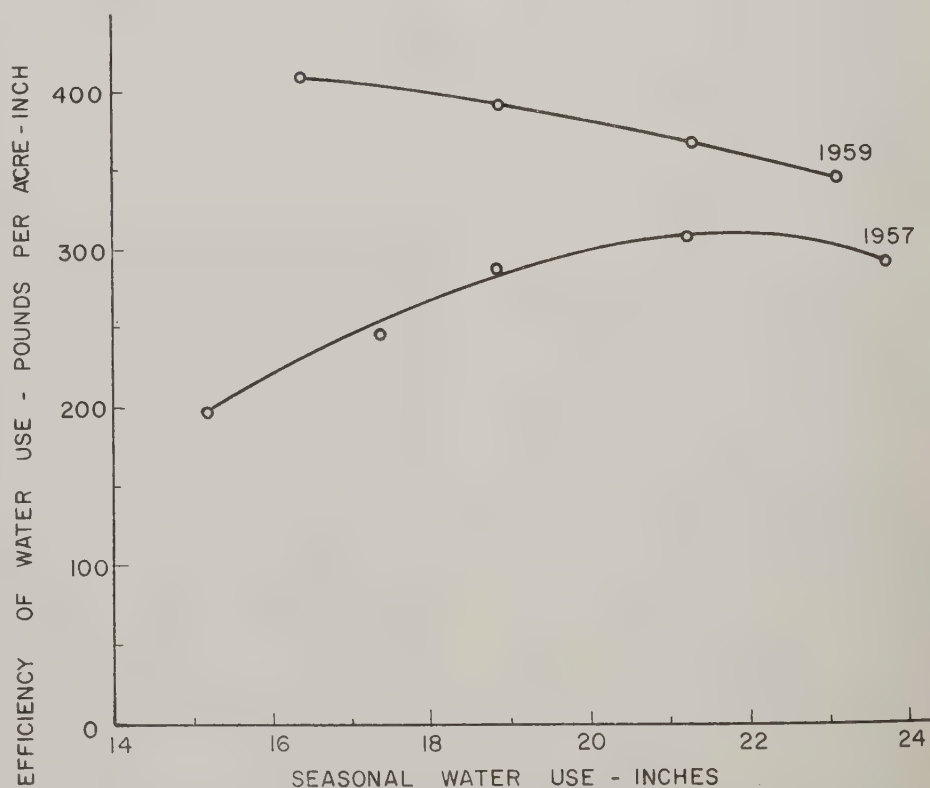
duced over 400 pounds of grain per acre-inch of additional water stored in the soil by irrigation.

There was considerable variation between total seasonal water use and efficiency of use in different years. For example, seasonal water use for maximum efficiency was about 20 to 22 inches in 1957 (see chart below). Four well-timed irrigations produced the highest efficiency of 305 pounds per acre-inch. But in 1959, the preplanting irrigation alone produced the highest efficiency of 407 pounds per acre-inch; and a seasonal water use of 16.4 inches was sufficient to mature the crop with only slight evidence of moisture stress. This stress decreased yields by only 1,220 pounds per acre, or 15.5 percent. In other words, the treatments which used the most water and produced maximum yields used water less efficiently for grain production.

During most years, near-maxi-

mum yields occurred for a total water use of 20 to 22 inches. Very little increase in yield occurred past 22 inches of water use. As the seasonal water use decreased below 20 inches, grain yields decreased at a faster rate. Other research in the Plains has indicated that from 8 to 10 inches of water must be available before plants will produce grain.

Two irrigations after planting usually resulted in near maximum yields. Where sorghum is planted in early June, the first irrigation may be applied in July and the second in August. Some conditions of soils, management, and weather may require more frequent irrigation. Coarser textured soils (sandy soils) which have lower water-holding capacities, shallow soils which limit rooting development and water storage, soils which are irrigated to shallow depths, and below-normal rainfall combined with hot, windy weather may

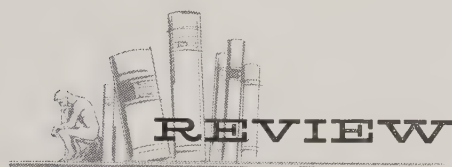


Relationship between seasonal water use and efficiency of water use for grain production, 1957 and 1959.

require 1 or 2 additional irrigations.

A limited water supply may be used efficiently by irrigating as many days during the year as possible. Off-season and preplanting irrigation can be practiced to spread the water over a larger acreage. Reasonably good yields can be obtained with only off-season or preplanting irrigation of deep soils. The soil should be wet to a depth of 5 to 7 feet. Yields from off-season or preplanting irrigation will vary considerably but will be more consistent than yields from dryland sorghum.

Other management and cultural practices are important to produce high yields. A fertility deficiency may greatly decrease yields and water use efficiency. Planting in narrow rows (7 to 14 inches) combined with optimum irrigation has increased grain yields. Adapted hybrids should be used. Weeds are a serious competitor for water and should be controlled. Water losses from ditches, field runoff, and deep percolation below the crop root zone should be minimized. Efficient use of water cannot be obtained from inefficient management or a poor water distribution system.



POWER TO PRODUCE: The Yearbook of Agriculture. 480 pp. Illus. 1960. Washington: U.S. Government Printing Office. \$2.25.

MAN domesticated draft animals long before he learned to write and read. He discovered the principle of the wheel at the dawn of civilization, about 6,000 years ago. These things brought revolutionary changes in the

power to produce on farms of the world. But with the exception of a few evolutionary developments, such as increasing the size of draft teams, the use of more pulleys and levers, etc., there were no substantial improvements in the farm power situation, until the invention of the steam tractor around the middle of the 19th century. Even then there was no great improvement in the power situation on the average farm. The modern revolution in power to produce on the farm did not really get under way until the 20th century. But during the past 50 years, and especially the past 25 years, the revolution in farm power has been phenomenal. That is the main theme of the 1960 Yearbook of the Department of Agriculture.

The book is divided into 9 main sections: Power in the Past; Power in the Present; Power on the Land; Power in the Harvest; Power and Livestock; Power in the Market; Power and Efficiency; Power and Its Effects; and Power in the Future. In each of these sections are several articles, written by specialists in the particular field, that give a wealth of detail and specific information. The book is indeed a wonderful reference work for anyone interested in past, present, or future power developments on the farms of America and other parts of the world.

Tractors get the main emphasis in this discussion of modern farm power; but other forms of power, including that supplied by trucks, stationary engines, and especially electricity, are also discussed with penetrating detail. The history of tractor development, from the cumbersome steam tractors of the 19th century to the specialized and all-purpose models of 1960, is given in interesting detail. The use of modern tractors with attachments for land shaping, ditching, plowing, cultivation, harvesting, and a multitude of other jobs gets full

treatment.

The phenomena of rural electrification on 97 percent of American farms, mainly since 1935, is pointed up with many interesting details. The revolution in farm living and sanitary conditions, mainly the result of electricity and other forms of farm power, gets due attention.

The abolition or modification of many of the time-consuming and distasteful chores, once thought to be a necessary evil, is one of the bright parts of the power revolution. The automation of numerous jobs is one of the spectacular results. But the outstanding results in efficiency of production have been the phenomenal decrease in the amount of man-labor now required to do nearly all types of farm work and the fact that American farmers now can do many jobs, such as land shaping, that were considered impossible a few years ago.

The concluding section on "Power in the Future" envisions many interesting possibilities, such as further automation and improvements in farm buildings and living conditions.

The 96 pages of photographs (which are in addition to the 480 printed pages) show many interesting historical developments and illustrate many of our modern machines. There also are many explanatory drawings, diagrams, and charts. This book is a fitting sequel to the many other interesting and informative Yearbooks the Department of Agriculture has published since it started its specialized series in 1938.

—TOM DALE

Ohio Develops Better Soil Test

A new soil test developed by the Ohio Agricultural Experiment Station tells more accurately how much lime must be added to soil to reduce its acidity.

If your address changes, please notify us of your complete new address, including zone or RFD number, and include old address with our code number as shown above.

The test is especially valuable when the soil contains large amounts of soluble aluminum. In such cases, the old test indicates that less lime is needed to raise the pH than is actually true.

The new test indicates more nearly the correct amount of lime regardless of the amount of soluble aluminum in the soil. It is now being used by the soil testing service of the Ohio State University.

As with the old test, it is a rapid test based on the amount of change in pH of a given amount of buffer by a given amount of soil. The new test makes use of a more dilute buffer mixture and a combination of buffers.

Aluminum, which composes 8 percent of the earth's crust, is not a new problem in Ohio. But soil scientists did not appreciate fully the impact of high amounts of aluminum on crops until plant studies designed to improve the lime requirement test were conducted. Due to the naturally high acidity of eastern Ohio soils, aluminum dissolves, making it easy for plants to absorb. Since the element is highly toxic, crops suffer.

Aluminum is further damaging because in a dissolved form it combines readily with soluble phosphorus, tying up this major crop element. If the stray aluminum supply is extremely high, eventually all phosphates may be recruited by the aluminum, leaving little phosphorus for crop use.

Maps to Show Subsoil Phosphorus and Potassium

Phosphorus and potassium fertilizer recommendations may someday be improved by a map which takes into account the amount of these elements in the subsoil, according to University of Wisconsin soil scientists. They envision a time, not too far away, when generalized maps will show the approximate amounts of these elements contained in the subsoils of various regions.

Since many farm crops can use a substantial part of the phosphorus and potassium in subsoils, the soil scientists think that fertilizer recommendations should consider the subsoil content as well as the topsoil content of these elements. Thus, a map showing the probable subsoil content could be used along with a soil test showing the topsoil content of one of these elements to arrive at more accurate estimates on the amount of fertilizer needed.

What Happens to Nitrogen Fertilizer?

A recent study by University of Illinois soil scientists showed that 2 years after application of commercial nitrogen the crops had used about 20 percent of the amount applied, 40 percent was still in the soil and presumably available for future crop use, about 10 percent had leached away, and 30 percent had vanished in

other ways, mostly through the air by denitrification.

The scientists point out that these amounts may vary according to soil conditions and the form of nitrogen applied. They also admit that there is much more to be learned about the behavior of nitrogen in the soil. And they are continuing their work to learn more about the denitrification process and what happens to the nitrogen still in the soil that hasn't been used by plants.

◆
Tobacco breeding research designed to add root-knot nematode resistance to the fight against tobacco diseases showed encouraging progress in 1959.

Cooperative work underway by the Experiment Station and Crops Research Division, USDA, has resulted in two promising families of breeding lines. They combine high resistance to root knot and black shank.

In addition, these lines showed some resistance to fusarium wilt and Granville wilt. They also had considerable tolerance to brown spot in 1959.

◆
Soybean varieties resistant to the soybean cyst nematode, a pest that stunts plant growth and can cause total crop failure, are expected to be ready for growers with infested land in about four years, according to ARS of the Department of Agriculture.

JANUARY 1961

Soil Conservation



CONTENTS

PAGE

- 123 Range Conservation
By Donald A. Williams
- 124 The Range Conservation Postage Stamp
- 125 Take Half and Leave Half
By Horace L. Leithead
- 127 Sod Busting on Mountain Meadows
By Charles N. Saulisberry
- 129 Pipe Replaces Ditch
By Robert E. Swanson
- 130 Range Management in Florida
By L. L. Yarlett
- 132 Youth Range Camp in Texas
By Rudy J. Pederson
- 134 Mountain Meadow Improvement
By Forrest M. Willhite and Hayden K. Rouse
- 136 Thorn Creek Cattlemen Work Together
By J. Boyd Price
- 138 Latar Orchardgrass
By Edwin O. Nurmi
- 140 They Farm the Bottomlands Again
By Claude D. Crowley
- 142 Reclaiming Gravel Mines
By J. B. Earle
- 143 Book Reviews

"Many organizations are dedicated to the conservation and sustained use of the Nation's soil and forage resources. We need to translate this ideal into a practical goal—the establishment of a system of agriculture in this country that will strengthen our economy, better feed our people, improve our land and increase its production to meet the needs of a growing population—in short, a grassland type of agriculture."

—F. G. RENNER



COVER PICTURE.—Sheep grazing under permit on the Rio Grande National Forest in Colorado.

Photo—U.S. Forest Service

Soil Conservation

EZRA TAFT BENSON
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

TOM DALE, Editor

15 CENTS PER COPY

FOREIGN—\$2.25 PER YEAR

\$1.50 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Range Conservation

By Donald A. Williams

MORE than half of the land in the continental United States is used for the production of native forage. Though a greater part of these rangelands are found in the western States, they are not confined to that region. Rangelands are found from Puerto Rico to Hawaii and from the piney woods and Gulf Coast marshlands of the South to the natural grasslands of the Lake States. The proper use and conservation of these grasslands are matters of great concern to all the Nation.

Only a few decades ago, with most rangelands deteriorating rapidly, many range specialists expressed doubts that much could be done to improve them without wholesale reductions in livestock numbers. The range conservation program of the past 25 years has proved, however, that much can be done to conserve and improve these grasslands while still using them. Millions of acres have been improved and the forage supplies increased even though these ranges are carrying more livestock than ever before.

The recent phenomenal improvement in range production on some areas is due mainly to application of the modern science and art of range conservation. The range conservationist no longer measures a given range on the basis of how many cattle or sheep it can carry with past or present management practices. Rather, he gauges it on the basis of its potential forage pro-

duction with the best treatment and management that range conservation science can provide.

A sound conservation program on rangelands starts with a knowledge of the soils, just as it does on lands used for other purposes. This important fact was overlooked for many years. Not until we learned how to recognize and map soil differences that were reflected in the native vegetation itself did we have a sound basis for conservation. This information gives landowners the key to the potential productivity of their range areas; and an appraisal of the condition of the range, area by area, furnishes the clues to the action needed for its improvement. Such an inventory of his soil and vegetation resources not only tells the rancher where his best forage-producing areas are located, but also indicates those parts of his range that need special attention.

After he has an inventory of his soil and plant resources the rancher has a considerable number of alternatives from which to select those that fit his particular needs. If forage production on some of his range areas has been so reduced that it will not recover in a reasonable period with good management, he may need to do some seeding. Other areas may have grown up to brush that will have to be controlled before the grasses can recover. Additional water supplies may be needed to eliminate concentrations of livestock and damage to the forage, and, in some cases, water-

spreading or a better irrigation system for the hay lands may be the quickest means of increasing the forage supply. The cost of such practices, as well as the time required before their benefits are fully realized, will also have to be considered before the rancher makes his final decision to include them in his conservation plan.

Rarely will one rancher's conservation plan be identical with that of his neighbor, because of the great variation between ranches in the size and number of pastures, past grazing use, and differences in soils and vegetation. All successful conservation plans on rangelands have some features in common, however. They provide for an intensity of use that permits "the grass to keep ahead of the livestock" and produce a full crop in succeeding years, and enough flexibility to meet the inevitable fluctuations in forage production that characterize most of the range country.

The rewards for improving the Nation's grasslands—nearly a billion acres of them—are enormous. Despite the considerable progress that has been made, the experience of landowners from one end of the country to the other has shown that forage production on most of our rangelands still can be increased from 2 to 6 times, an improvement that will provide better protection to our soils and insure the increased meat supplies we will need in the future.



The Range Conservation Postage Stamp

THE world's first range conservation commemorative postage stamp will be issued February 2, 1961, at the annual meeting of the American Society of Range Management in Salt Lake City, Utah. It will go on sale at other U.S. Post Offices the next day, February 3.

The stamp is the eighth in the Conservation Series that has included four wildlife stamps, and in the last three years, stamps featuring forestry, soil conservation, and water conservation.

The new 4-cent stamp will be in three colors—blue, reddish brown,

and black. It is a split-frame stamp, one part being a reproduction of "The Trail Boss," a famous sketch by Charles M. Russell, noted western artist, the other half showing a modern range conservation scene. The stamp symbolizes the development of range conservation from the pioneer days of the open range to today's scientific management techniques.

The Soil Conservation Service, Forest Service, Bureau of Land Management, and Bureau of Indian Affairs are cooperating with the Post Office Department and the American Society of Range Man-

agement in promoting the stamp.

Although the stamp will be of most interest in the range country, stamp collectors and conservationists everywhere should be interested in it.

Those who wish to have a "first-day cover," a souvenir envelope, can mail addressed envelopes plus a money order or certified check for the number of stamps desired to the postmaster at Salt Lake City, Utah, who will place the range conservation stamp on the envelopes, cancel with a special cancellation mark used only on that day and at that place, and mail as addressed.

Take Half and Leave Half

By Horace L. Leithead

TWENTY-FIVE years ago the theme song of most livestockmen was, "If and When It Rains." Today many a stockman's slogan is, "Take Half and Leave Half," and for a good reason! Their experiences prove that there is more profit in harvesting half of the crop and leaving the other half for soil protection and future grass growth.

Let us examine some of the reasons why ranchmen everywhere are saying, "Since I started leaving half of my grass crop on the ground, my range has been getting better and my profits are going up."

Soil is a reservoir for storing moisture and plant nutrients. But before plants can use all the available water and nutrients, they must develop root systems big enough to occupy the entire soil profile.

Roots develop in about the same proportion as leaf and stem growth—the roots feed the tops and the

tops feed the roots.

Undisturbed, this process of plant growth continues in both annual and perennial grasses until the plants mature. Even though the roots of perennial grasses are known to remain active for two and sometimes three years, most of the top growth in any one season is produced from roots that grow that same year.

The intensity with which plants are grazed during the growing season can control plant root development and forage production. This fact is now recognized by many ranchers.

Research by Franklin J. Crider to learn the growth habits of grass roots under different intensities of grazing gives strong supporting evidence of this. When he removed 90 percent of the foliage from a plant during its rapid growth period, all of the roots stopped growing for 17 days. When he took 70 percent of the tops during this same period, approximately 70 per-



The intensity of grazing affects root growth of 3 little bluestem plants. The plant at the left had slightly less than 50 percent of the top growth removed by grazing during the growing season; about 65-70 percent of the top growth was removed from the plant in the center; the plant on the right was grazed extremely heavy during the same period.

cent of the roots stopped growing for five days. Yet when he removed 50 percent or less of the top growth, it had little effect on root growth.

In addition to the effects of close grazing on root growth, August Jantii and Paul J. Kramer, in their research on plant-soil-moisture relationships, pointed out another factor that affects forage yields. They found that ungrazed plants have a physical force for pulling or pumping moisture from soil that is equivalent to 200 pounds atmospheric pressure per square inch. This force is reduced 87 percent when the tops are grazed off.

Their research may explain why there is poor regrowth on ranges that are grazed heavily during a period when soil moisture is low.



A range near Ozona, Tex., that has been properly used for several years.

Note:—The author is range conservationist, Soil Conservation Service, Denver, Colo.

Soil moisture during dry periods may be adequate to keep ungrazed or properly grazed plants growing normally. But this moisture would not be available to heavily grazed plants, which are forced to become dormant because they have lost their physical force to absorb enough moisture from the soil for growth.

Farrel A. Branson gives two other reasons why close grazing and grazing at the wrong season can affect root development and forage production. He explains that when the growing points are two or more inches above the ground, they are likely to be grazed off with heavy use. If the growth points are removed any time during the growing season, no new leaves are produced by those stems that year.

And he points out that leaf growth stops when a plant develops fertile seed stalks. Plant food reserves usually are at their lowest in the roots when the plant starts to head out. Removal of more than 50 percent of the foliage at this stage may not only stop plant growth for the season, but also hinder the plant's chances of replenishing its food supply before the growth season ends. The plant will be weak instead of strong and vigorous the coming year.

Grass plants may be considered old-fashioned in their food storage habits. They store most of a year's supply of food in a manner similar

to that of the pioneers, who canned a year's supply of food in the fall and stored it in a cellar.

Perennial grasses store food in their roots in late summer or early fall. This process starts at the time of seed formation and continues until dormancy. Plants use some of this food reserve during the winter or dormant period. But 70 to 75 percent of the stored food is used to start new growth in the spring and to help keep the plants growing vigorously until the growth cycle is completed and another seed crop is produced.

Harvesting more than 50 percent of the foliage, particularly during the most active growth period, can disrupt this process and weaken the plant. Repeated harvesting year after year during this period can actually starve plants to death.

"Take half and leave half" applies to grazing of ranges during the dormant season just as it does during the growing season. The foliage may be dormant, but the plants have planned ahead for the coming year. Growth buds are formed in the fall on the root crown from which new top growth is produced.

These buds are alive. They have sap in their cells. If the root crowns are exposed to the severity of winter storms and rapid fluctuations in temperature, the sap can freeze and burst the plant cells, killing the newly formed buds.

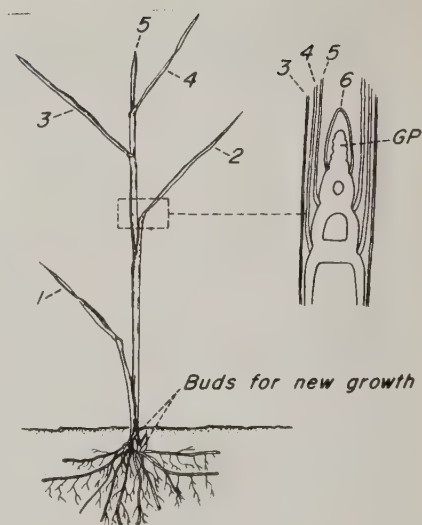


Diagram of a young western wheatgrass stem, and an enlarged cross-section, showing the general appearance of the growing point (GP) and the leaves. The leaves and corresponding portions of leaves on the enlarged insert are numbered for identification.

A good stubble on the ground during the dormant period reduces this type of plant damage. Soils are several degrees warmer at the surface if they have a mulch cover than if they are bare. The stubble also protects the soil from wind. It holds snow and helps in other ways to conserve moisture.

Frank Rauzi, who has been doing research on water intake by the soil on range sites, finds that the rate of water intake, regardless of soil type, depends on the type of plant cover, the amount of standing vegetation, and the amount of vegetative mulch on the ground.

On a silty site near Newell, S. Dak., the intake rate was .61 inch per hour at a location that had 1,200 pounds of vegetative material per acre, as compared to an intake rate of 1.43 inches per hour at a location with 2,600 pounds of vegetation on the surface.

When ranges are properly used, they improve in condition. As ranges approach good to excellent condition, the entire plant-soil-moisture relationship comes into balance. Erosion is brought to a



On Tom Britt's ranch, near Wheeler, Tex., the pasture at left was deferred from the beginning of the growing season until seed had ripened in the fall; the pasture at right was grazed during the growing season, but was properly used.

minimum. Gullies that once were active grass over. This is because water intake by the soil increases and runoff is reduced.

As ranchmen acquire the knowledge of how grass grows, and how different intensities of grazing can affect the growth processes, they are developing grass management programs that make it possible for them "to have their grass and eat it, too." Such programs are being developed for all types of ranges in soil conservation districts throughout the range country.

Proper use of the grass crop is the basic objective of these grass management programs. To achieve this goal, livestock numbers must be kept in balance with the annual forage supply.

A rotation-deferred system of grazing will regulate the season and, to a large degree, the intensity of use on some of the major forage species. Livestock prefer some types of food over others. This preference results in some species being grazed more readily at certain seasons and at different stages of plant development. Some plants are grazed off at the ground. On others, only the seedheads are eaten. On still others, it's the basal leaves that are taken. Thus, some plants are overused every time livestock graze a range.

Even though overuse of a plant for one season may not kill it, overuse will weaken the plant and curtail its production. A systematic deferment of all pastures every two to four years discourages livestock from overusing the same plants year after year.

This system of grazing also gives all plants the opportunity to complete their growth cycle periodically and produce a seed crop. This is important in a grass management program if the more palatable species are to remain vigorous and continue to hold their own in the plant community.

Fencing often is needed before a rotation-deferred system of grazing

can be carried out effectively. Fencing ranges according to range sites is the easiest way to control the season of harvest as well as the degree of harvest for the different species of grass.

Livestock watering facilities such as ponds, wells, and pipelines, if properly located and built, also help in distributing livestock over the entire range unit.

Brush control is another range practice that is planned and applied when the rancher is sure it will improve the grass. This practice should not be done until the operator is in a position to defer these areas for at least one year following treatment and to properly use the grass on these areas when grazing is resumed.

This "take half and leave half" idea is so important to the overall conservation program on rangeland that the Great Plains Conservation Program requires all cooperators to

schedule "proper use" as a contract item even though the Government does not cost-share on it.

Aside from the conservation aspects of proper use, it makes money for ranchers every time they apply it. Vernon W. Baker, of SCS, made an economic evaluation of the proper use practice for several ranchmen in the sandhill area of Yuma County, Colo., in 1960. This evaluation showed that, on the average, ranchmen who had grazed their ranges properly netted about 44 cents per acre, where overused ranges returned about 19 cents per acre.

Yes, the slogan, "Take half and leave half," is popular with conservation ranchers everywhere. It causes their ranges to absorb more moisture when it rains. It brings erosion to a minimum. It produces more grass. It improves the condition of their ranges, and puts more dollars in their pockets.

Sod Busting on Mountain Meadows

By Charles N. Saulisberry

WHAT to do about improving native mountain meadowlands has been a tough problem for livestock producers of northeastern California. Ranchers in Modoc County, who own the largest acreage of such lands in the State, have launched a program that they hope will get them top forage production.

The sodbound and rough condition of the wet native meadows has resulted in poor forage production over the past 20 years. Fertile soils are waterlogged, rootbound, and

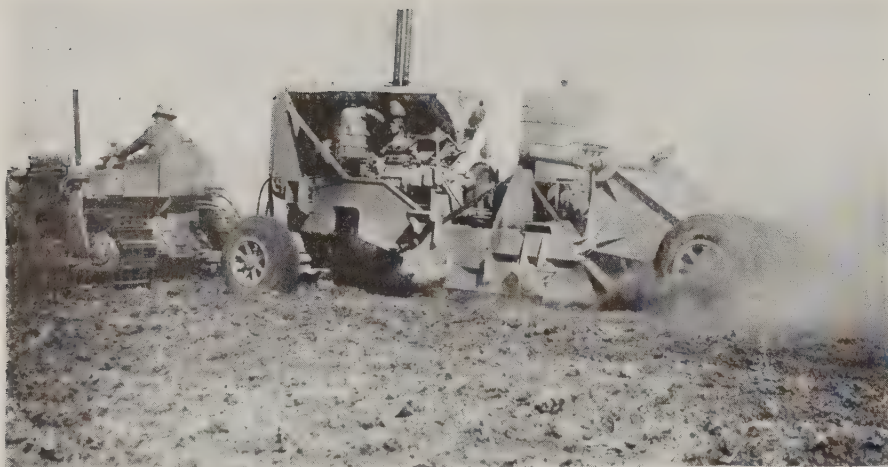
compacted and capable of supporting only the less productive types of vegetation.

In eastern Modoc County's Surprise Valley Soil Conservation District, ranchers have undertaken a three-year meadow renovation program that includes drainage, breaking up the sod, leveling to grade, and seeding back to improved grasses and legumes.

W. O. Hussa, cooperator and former district director, was one of the first in the area to try this program.

He asked Soil Conservation Service technicians to help determine the feasibility of the project by

Note:—The author is work unit conservationist, Soil Conservation Service, Cedarville, Calif.



"Sod buster" in operation on the W. O. Hussa ranch.

checking soil conditions and making an engineering survey to determine the size of the earthmoving job. On this field, drainage wasn't necessary.

His first step was to run a chisel through the native sod about 14 inches deep. His next move was to get the tough sod plowed and broken up. He contacted rancher John Murphy, at Adel, Oreg., who had designed and built a mechanical "Sod Buster." This machine, powered by a heavy tractor motor with specially designed cutter knives, was run through the meadow to an 8-inch depth and completely shredded and disintegrated the sod. Then SCS technicians staked the field for leveling, and

Hussa leveled it to grade.

The following year, the field was planted to grain. Following harvest, the field was re-leveled and seeded to improve grasses and legumes.

Smooth brome grass, orchard grass, Alta fescue, red clover, and Alsike clover are best adapted to seeding on these lands. Yields up to 6 tons of high-quality hay have been taken off similar lands. Use of commercial fertilizers and proper irrigation and use will insure long-lived, high-producing stands.

Costs involved in this type of project where livestock is the main production may seem high. However, increasing hay yields from 2 tons per acre to 6 tons in a 4-year

period is pretty good evidence that native meadow renovation pays off. Furthermore, the quality of the improved legume-grass hay is superior to the native hay.

Hussa's cost record showed that his 28-acre project cost about \$110 an acre, spread over the three-year period. The total cost includes \$20 for sod removal, \$65 for land leveling, \$10 for seeding, and \$15 for chiseling, disking, harrowing, land planing, and installing the border irrigation system.



Improved grass-legume hay crop that yielded 6 tons per acre in 2 cuttings on a recently renovated native meadow.



W. O. Hussa looks over a freshly renovated area at right, while standing in a part of the native meadow that has been chiseled to a 14-inch depth.

Recognizing this high cost and also the extreme need for this work in the county, the Modoc County ASC Committee developed a special practice by which ranchers could receive up to \$55 per acre through the Agricultural Conservation Program. This payment is spread through the three-year renovation period, and includes the sod-busting, leveling and re-leveling, and seeding back to grass. At the present, this is the only county in the State where ACPS cost-shares for such a practice.



Per capita consumption of meat in the United States in 1959 averaged 160 pounds.

Pipe Replaces Ditch

By Robert E. Swanson

SUPERVISORS of the Dry Creek Soil Conservation District point to the installation of a \$9,500 irrigation-water delivery system serving 8 farms in Ada County, Idaho, as evidence of good teamwork by farmers.

The new project includes 5 water control structures and 2,950 linear feet of concrete pipe. The system delivers water to 460 acres of diversified crops, including corn, small grains, clover, pasture, and alfalfa hay. It replaces nearly a mile of seepy, rodent-infested ditches. One section of a ditch was so badly gullied it could hardly be used at all.

The old delivery system, leading from the Farmers Union canal, had given many a headache to John Reutzel, Galen Hulse, Art Bolen, R. E. Grove, Victor Kent, Walter Lee, Ira Waite, and Harold Hadley. They knew that a lot of water was seeping away in the lateral ditches before reaching their farms. And because of the eroded material which continually washed into field ditches from above, the job of maintenance seemed endless.

In October 1959 these farmers called upon supervisors of the Dry Creek SCD for help in solving their water problems. Philip A. Whiting, SCS engineer, was asked to make a preliminary survey to find out the feasibility of replacing the open ditches with pipe. The survey showed that it could be done. The estimated cost of materials was \$6,000.

During the winter, the group met several times with SCS technicians and district supervisors to agree upon a construction and operations plan. At one of these meetings, the farmers decided to use their

own labor to lay the pipe and build the structures. Next, the group entered into a partnership project called a "pooling agreement" which provided for financial help under the Agricultural Conservation Program. Then Whiting completed the design of the system and construction began in March 1960.

The plan called for 2,718 linear feet of 15-inch concrete pipe and 232 feet of 10-inch pipe. A total of 5 structures were provided for—each with suitable water-measuring devices.

A local contractor excavated the trench for the pipe. The farmers themselves did all the other jobs, which included laying the pipe; backfilling the trench; and building the inlet, diversion, and outlet structures. About 18 cubic yards of concrete was used in the structures.

SCS men supervised construction. The system was ready for



Water control structure is examined by John Reutzel and son.

use at the start of the 1960 irrigation season. Engineer Whiting believes the results have been so successful that several more group irrigation jobs will be completed in the Dry Creek SCD in the next two years.

John Reutzel, a group member who took over the task of collecting assessments and paying bills during the planning and construction phases, says: "We have at least one-third more water for use on our crops as a direct result of the pipeline. And the labor that formerly was spent on ditch maintenance now is being applied to the improvement of our individual farms."



The farmers concerned use their own labor to lay the 15-inch concrete pipe that replaces the old irrigation ditch.

Note:—The author is work unit conservationist, Soil Conservation Service, Eagle, Idaho.

Range Management in Florida

By L. L. Yarlett

THE history of Florida's cattle industry dates back further than that of any other State. In 1521 Ponce de Leon brought the first cattle to Florida and late in 1530 additional stock were introduced by DeSoto. Although small in number at first, cattle have utilized the native forage of the flatwood, prairie, fresh marsh, and hammock range sites for nearly four and one-half centuries.

Cattle were herded in the vicinity of St. Augustine as early as 1712 by cattlemen who supplied beef for the Spanish garrison. In northwest Florida sizable herds of cattle grazed the meadows along the banks of the Apalachee and Apalachicola Rivers about 1740. Great herds of cattle were owned by the Miccosukee Indians in the northern part of the State during the 1770's. Micanopy, great chief of the Alachua branch of Seminoles, and his father owned large herds in the vicinity of present-day Gainesville.

Trailing of cattle predated the

Note:—The author is range conservationist, Soil Conservation Service, Sebring, Fla.



Salt marsh range in excellent condition, in the Gulf Soil Conservation District, with smooth cordgrass and seashore saltgrass being the principal forage plants.

historically famous western Chisholm and Goodnight Trails by as much as 120 years. Long cattle drives originating in north and central Florida terminated near Ft. Myers where they were loaded on schooners and sailing vessels bound for Cuba. Cattle markets did a flourishing business in the coastal towns of Jacksonville, Punta Rassa, Pensacola, and Cedar Keys as early as 1780 and 1800.

Present business risks and problems of the cattle industry are much the same in Florida as elsewhere. Drought damage, common

despite a 52-inch average rainfall, is due mainly to the low water-holding capacity of the sandy soils. Seasonal dry spells during winter months often hamper growth of improved pastures, and the need for sufficient high-quality winter forage continues to be a major problem. Sharp and sudden changes in temperature have been experienced. Ranchers in the Okeechobee Soil Conservation District recall the big freeze and cold rains of 1951 when thousands of cattle died.

Livestock production is relatively low, mainly because of the nutritive deficiency of range forage during fall and winter months. Sharp seasonal variations in forage value are characteristic of Florida ranges. Supplemental feeding or tame pastures are recognized as a must in any good range operation.

Approximately 14 million acres in Florida grow native plants that furnish all or part of the forage for about 1.5 million beef cattle. In a 30-county area of southern Florida, 9 million acres will probably remain in native range even after the present 1 million acres of tame pasture is doubled. Native



Range cattle on a typical flatwood range of Florida that has been overused until wiregrass and carpetgrass are the principal forage plants.

range plants now provide 54 percent of the forage consumed.

Ranching operations now depend to a large extent on the production from native ranges, and such ranges will continue to be the foundation of the Florida beef cattle industry for some time to come. This will be true despite the superior production and nutritional value of improved pastures of white clover, pangola, bahia, and coastal Bermudagrass. Ranchers give a simple reason for this. Native range is available and inexpensive although production per acre is generally low. Most operators feel there is an economic limit to how much improved pasture can be developed and maintained on a practical basis.

Research studies at the Ona Range Cattle Station indicate that a range and tame pasture combination is sound and economical. Most soil conservation district programs for range conservation are based on such a combination.

The basic principles of range management apply in Florida, as elsewhere. Plant succession is vividly evident. Fence line contrasts between relic areas and well managed ranches show the familiar picture of range ecology in action. Throughout the 2 million acres of fresh marsh, the climax maidencane and cutgrasses decrease with grazing pressure. Under too close use these plants are generally replaced by pickeralweed, a common perennial weedy invader. Five million acres of flatwood range vigorously support many species of climax grasses. Notable among these are creeping bluestem, Florida threeawn, lopsided Indiangrass, cutthroatgrass, blue maidencane, broomsedge, and switchgrass. With continuous overuse, however, pine-land threeawn (wiregrass), carpetgrass, longleaf and fringeleaf paspalum, bottlebrush threeawn, and annual spikerushes invade.

Saw-palmetto is the main woody invader of the prairie and flatwood ranges. This prostrate-growing member of the palm family plays



Improved pasture of fertilized pangolagrass, with water control measures to provide irrigation during winter and drainage during summer, furnishes abundant summer forage and permits deferment of native range.

a familiar role. Within the palmetto clumps, protected and out of reach of cattle, are found many of the desirable range grasses, a seed source for range recovery.

Salt marshes generally are the highest producing sites in Florida. Here seashore saltgrass and smooth and marshhay cordgrass furnish a tremendous volume of forage during the otherwise critical winter months. But black rush, a poor forage plant, quickly invades heavily grazed salt marsh and forms dense stands.

The Monreve Ranch near Stuart, in the Martin Soil Conservation District, is an example of good

range management in practice. The flatwood ranges are deferred from March through October, while cows and calves graze on approximately 1,000 acres of pangolagrass and white clover pastures. Cattle are run on 4,000 acres of unburned native range from November through February and fed a 3-1 meal-salt supplement, free choice.

In southern Florida fire is widely used by ranchers to reduce old growth or "rough" of wiregrass, in order to obtain early green growth and spring grazing. However, Dick Kelly, manager of the Monreve, believes that ranges should be burned only about once



Supplemental feeding of a 3-1 meal-salt mixture plus minerals and vitamins on the Monreve Ranch.



Typical growth of saw-palmetto, which is the principal woody invader of overused Florida ranges.

in six years if adequate supplement is used. He is also of the opinion that winter grazing of ranges, with supplements, yields far more forage and beef than spring grazing on ranges that are burned early in the spring.

Although the bulk of the Mon-reve forage comes from the improved pastures, the native range forage contributes an important item toward a 12-month feed and forage schedule. This system of management is producing a 90% calf crop with 525-pound calves at 8 months of age.

Much remains to be done to materially increase good range management on Florida ranges. Control of surface water during the summer rainy season is needed. Specific



A flatwood range site in Florida that is in good condition, with toothache-grass, Florida threeawn, and broom-sedge bluestem the principal forage species.

nutritive value of the major native grasses month by month needs to be determined. Research is rapidly finding ways and means to control saw-palmetto economically, as well as the use of fire in controlled burning.

Many native grasses are readily grazed but the rancher does not

recognize them as being essentially different from the widely known "wiregrass," or pineland threeawn. Ranchers and district cooperators generally show a keen interest and are ready to make management decisions for good range conservation upon learning that all grass is not wiregrass.

Youth Range Camp In Texas

By Rudy J. Pederson

FOR the past six years, 30 to 40 boys from all parts of Texas have studied and worked together for a full week at a Youth Range Camp, sponsored and conducted by the Texas Section of the American Society of Range Management. The camp is in central Texas, in the heart of the range country. A total of 176 boys have attended to date.

Work at the Youth Range Camp is in keeping with the objectives of the American Society of Range Management—"to foster advancement in the science and art of grazing land management . . ." The stated objectives of the camp are to recognize boys interested in range management, to develop leadership, and to give advanced training to boys in practical range and ranch management.

Boys over 13 years old who are active in 4-H or FFA programs are eligible to attend. Individual expenses are paid by some local organization. In 1960, soil conservation districts, service clubs, banks, ranchers, FFA Clubs, farm bureaus, and the Sheep and Goat Raisers Association sponsored 32 boys. The expenses, not including travel, were about \$30 for each boy.

Fortunately, it has been possible to use facilities for housing and eating at the A & M College field camp at Junction, Texas. Without these facilities it would be difficult to operate the camp, since good food, sanitary housing, facilities for recreation, and easy access to the range are essential for smooth operations.

Last year 20 members of the Range Society assisted in the training. They were mostly professional people from the Extension Service, Soil Conservation Service, experiment stations, colleges, livestock organizations, ranches, vocational agriculture schools, and other groups. Five members of the Society stay all week at the camp and direct activities. Other members come for a day or two to give specialized instruction or demonstrations.

A few ministers are members of the Society and have spent the week or have been there for morning and evening discussions and devotionals.

The boys are housed in three buildings and are divided into three "ranches." Each ranch elects a "Range Boss" and a "Foreman." They thus can run their own affairs and help direct the camp. Each group wears a leather bolo tie

Note:—The author is range conservationist, Soil Conservation Service, San Angelo, Texas.

with the brand of an old-time ranch on it.

Field trips to nearby ranches and discussions by the ranchers out on the range concerning their operations and grazing management brings the classroom work into use. Usually two ranches are visited during the week. A trip is taken to the Sonora Range Experiment Station to show the boys what is being tested. Subjects covered during the week include: kinds of plants and how they grow, plant and soil development, range condition, wildlife as a product of the range, range management practices, watershed treatment and management, range judging, veterinary work and livestock testing, career opportunities in the field of range management and conservation, and related subjects.

Notes are taken during discussions and field trips. A notebook and a plant collection are submitted by each boy at the end of the week. These are reviewed by the directors of the camp, and ten boys who have prepared outstanding plant collections or notebooks or have shown exceptional attitude and cooperation are given special recognition.

A range management plan is developed by each boy for a problem ranch. Several of these are presented to the group and lively discussions are held about what should



Lecture and discussion at the Youth Range Camp.

be done. These discussions bring out the alternatives in management and treatment. They give the boys a chance to show what they learned during the week and are considered one of the most valuable parts of the program.

Two boys participate in radio programs each day and explain the day's activities and what was learned. This helps to train the boys and also tells the radio audience about range conservation and what is being done at the camp.

A certificate embossed with "Trail Boss" and a Range Society emblem are awarded each boy. He also receives a western belt engraved with the words "Range Camp." An attractive brochure with pictures and review of the activities is later sent to each boy.

After the boys have returned to their homes, they arrange with their sponsor for an official report of their week at camp. A set of color slides, showing the activities, is sent to them and each boy explains activities of the camp and what he learned to his local sponsor, usually at a local service club, FFA or 4-H Club, district supervisors meeting, or other appropriate occasion.

The first range camp was conducted in 1955 when Roger Landers, a rancher and soil conservation district supervisor, was chairman of the Texas Section of the Range Society. He has three sons and was well aware of what they would gain by such a program. A Range Society youth committee under the leadership of Fred Walker, Extension range specialist, organized the first range camp. Members of the Range Society have taken an active part and it has been successful because many organizations have worked together.



A rancher explains how he manages his ranch, while boys examine his lush stand of grass.

Top-dressing hay and pasture fields to replace the plant nutrients after the first cutting can pay off in more high-quality forage, lower feed costs, and extra profits from beef and dairy herds the rest of the season, according to University of Nebraska Extension agronomists.

MOUNTAIN MEADOW IMPROVEMENT

By Forrest M. Willhite and Hayden K. Rouse

No. 60

This is the sixtieth of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

IN the mountainous regions of the 11 Western States there are about 5 million acres classed as mountain meadows. These areas lie mostly along stream valleys and produce hay and pasture which are used by ranchers, often in conjunction with grazing on adjacent rangeland. They occur at elevations of from 5,000 to 11,000 feet and have frost-free seasons ranging from about 100 days down to seasons when the thermometer drops to 32 or below every night.

The topography and soils of most mountain meadows present a challenge. The sloping and undulating topography makes good irrigation difficult. Soils, formed mainly from stream-laid material, may have a sod mat varying in thickness from 1 to 2 inches over cobble, to a sod mat 6 inches or more over deep,

fine-textured soil. All of these soil variations may and frequently do occur in areas too small for practical individual treatment.

The ranchers who brought these areas into hay production often adopted the practice of diverting water from a stream and letting it spread from their ditches over the meadows and back to the stream. Irrigation started with the first spring thaw and continued as long as there was water, or until haying time. Later, diversions brought water to higher slopes, making the lower areas even wetter than before.

Under such conditions, sedges and rushes, which produce 1 ton or less of hay per acre, grow in the flooded areas. A large percentage of the meadows falls in this category. Where drainage is better and intermittent irrigation is used, alsike and timothy do well. With good drainage and controlled irrigation alfalfa may be grown.

Note:—The authors are, respectively, soil scientist and agricultural engineer, Agricultural Research Service, Fort Collins, Colo. Willhite also is associate agronomist, Colorado Agricultural Experiment Station.



Blackstock experimental plots near Gunnison where irrigation, fertilization, and time of cutting grass and grass-legume mixtures were studied in detail.

In 1949, at the request of interested ranchers, the Agricultural Research Service, Soil Conservation Service, and Colorado Agricultural Experiment Station started research on mountain meadows. Problems needing study were drainage, frequency and amount of irrigation, methods of irrigation, adapted species for the diverse climatic and soil conditions, time of cutting, quality of forage, fertilization, and finding what these practices meant in beef production and overall ranch operations. Ranchers provided experimental sites and set up corporations to assist in feeding trials.

This research has shown that yield and crude protein of hay and pasture can be increased and the efficiency of ranch operations improved. It has indicated a need for better drainage and irrigation. It has shown the need for fertilization, more timely harvest, and a shift to higher producing grasses and legumes to replace the sedges and rushes.

First, fertilizer trials with nitrogen and phosphorus were conducted on about 30 ranches representing wide variations in climate, soils, water control, and plant species in the Colorado intermountain area. The results showed that without water control sedges and rushes



Field day at the Carpenter Ranch near Hayden to observe and discuss research results in mountain meadow improvement.

dominated in the wet meadows, yields were low, and fertilizers were of little value. With good irrigation practices and adequately drained land, alfalfa and brome-grass produced excellent yields and nitrogen fertilization did not increase yields. Grass alone, with adequate but not excessive irrigation, responded well to nitrogen fertilizers. Phosphate increased yield on only one ranch of the 30 tested.

Crude protein content of the hay varied from 4 to 12 percent. The presence of legumes, as well as early cutting of grass before bloom, resulted in higher protein content.

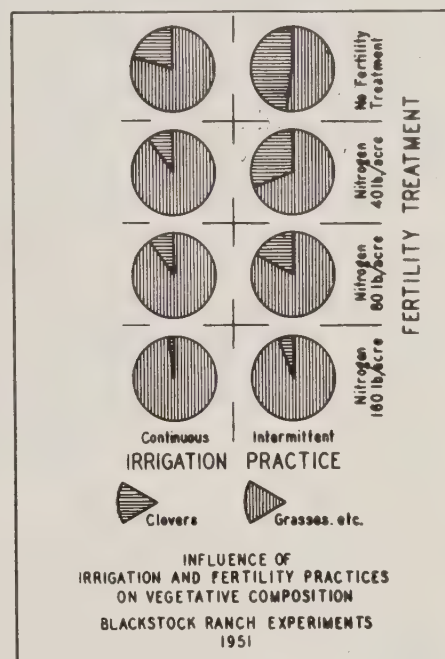
Results of these early trials indicated the need for further study. Experiments were set up on the Blackstock ranch at Gunnison, Colo. Three years' tests there showed that with continuous irrigation, 136 inches of water were applied for each ton of hay produced

per acre. Most of this water passed through the soil. With intermittent (sprinkler) irrigation only 6 inches of applied water were needed to produce one ton of hay per acre—a saving of 130 inches.

Clovers were crowded out of the initial grass-legume mixture by continuous irrigation. Sedges and rushes came in to replace them and much of the grass. Intermittent irrigation maintained the highest percentage of clover. Nitrogen fertilization increased yields on intermittent irrigation but lowered the proportion of alsike and mammoth red clover. Some typical results are shown in the chart at right.

The Blackstock ranch studies also have shown that: (1) Nitrogen fertilization or a high proportion of clovers increases the protein content of the hay; (2) high rates of nitrogen (over 240 pounds per acre) produce higher yields and

crude protein contents than could be obtained with grass-clover mixtures; (3) present varieties of clover are satisfactory in only about 4 years in 10—ranchers speak of “clover years” and “non-clover years”; (4) plants take up only 40 percent of the nitrogen applied as fertilizer. Recovery is poorer than this at high rates of application.



Additional experiments were established at Hayden, Gunnison, and Fairplay, where the average frost-free seasons are about 90, 70, and 50 days, respectively. Ranchers at these places who practice poor water control and late harvest on unfertilized sedges and rushes average about 1.2, 1.0, and 0.8 tons of hay per acre. The total crude protein is about 150, 120, and 90 pounds per acre, respectively.

When irrigation was controlled and the sedges and rushes replaced with brome-grass but no nitrogen used, production remained about 1 ton per acre. But when nitrogen fertilizer was applied at rates of 200, 400, and 800 pounds per acre, the yields of brome-grass hay were increased on the respective plots to about 2.5, 3.5, and 4.3 tons per acre.



Nitrogen fertilizer, no treatment, and nitrogen plus phosphate plots (left to right) produced 2.9, 2.0, and 3.0 tons of hay respectively with water control, on the Spann ranch near Gunnison.

With good irrigation and drainage and replacement of the rushes and sedges with alfalfa or an alfalfa-brome mixture the hay yields were increased to about 3 tons per acre, without fertilization. The use of nitrogen fertilizer on these plots did not appreciably increase the yields of alfalfa alone, and gave increases of less than 1 ton per acre for the alfalfa-brome mixture, even with 800 pounds of nitrogen per acre.

These results indicate that where grass is planted alone nitrogen fertilization is necessary to get substantial benefits from the improved

irrigation and drainage; but, if an adapted legume is planted with the grass or alfalfa is planted alone, good yield increases may be expected without nitrogen fertilizer, and heavy nitrogen fertilization is unprofitable.

Some salient facts produced by research on soil and water management and its effect on conversion of the forage to beef from feeding

experiments in a cow-calf operation are given in the table below.

The research results have shown the importance of drainage, irrigation control, legumes where adapted, and nitrogen fertilization of grasses. Better legume varieties are needed. The most difficult job is applying these findings to the difficult terrain and extremely variable soils.

	<i>Usual ranch practices</i>	<i>Improved practices</i>
Tons of hay per acre	1.0	4.0
Pounds of crude protein per acre	120	960
Inches of water per ton of hay	136	6
Pounds forage to produce 1 pound beef	20.3	13.3
Pounds water to produce 1 pound beef	208,000	13,000

Thorn Creek Cattlemen Work Together

By J. Boyd Price

WE'VE got to make an adjustment—let's increase the feed instead of reducing numbers," reasoned Don Fredericksen. This statement was made several years ago at a directors' meeting when Fredericksen was president of the Thorn Creek Cattle Association. The other directors agreed. They all had the same problem—not enough range forage for the number of livestock they wanted to run.

With increased feed as an objective, they plotted a course of action and began a development program with no apparent end. Range improvement projects are planned for several years to come and they have been at it now for almost 10 years.

They began with the purchase of about 2,000 acres of deeded land. They used this to get the Bureau of Land Management to put to-

gether a 7,000-acre block which could be improved and managed as a grazing unit.

Fencing, the first requirement, was completed the first year after the land was acquired. Contractors asked \$700 a mile for fencing. That sounded too high, so the stockmen built it themselves for less than half as much. Thus began a range improvement investment which has run close to \$80,000 with participation by the Bureau of Land Management and cost sharing by the Agricultural Conservation Program Service.

In 1953 the Association asked the Wood River (Idaho Pilot) Soil Conservation District for assistance in developing a coordinated conservation plan on public and private rangelands. Through cooperation with the district and assistance from Bureau of Land Management and Soil Conservation Service tech-

nicians, an overall range conservation and development plan was worked out.

Action began immediately with the seeding of about 200 acres of burned-over brushland to crested wheatgrass. Other improvements called for in the plan included 3 miles of cross-fencing, 2 spring developments, 10 stock ponds, 1 stock watering well, 300 more acres of seeding, 2 miles of stock trails and roads, and brush control by spraying on about 5,000 acres.

From the beginning, this unit has shown marked improvement in range condition each year, despite several dry seasons. This was confirmed in 1958 when the association directors, together with SCS and BLM range specialists, made a range condition check to determine the effectiveness of the management plan. The seedings were well established and native range had been

Note:—The author is area range conservationist, Soil Conservation Service, Twin Falls, Idaho.



A water development at Rattlesnake Spring that was installed in 1959 by the Bureau of Land Management. The overflow is piped into the pond in the background.

maintained or improved on every area checked.

Deferred grazing is practiced on the total unit each year. Livestock use is limited to two months beginning August 1. Salt is placed in strategic locations to coax cows onto lightly used areas. A rider is hired for the entire season to drift stock into better feed, keep a close vigil on the water, and prevent livestock concentration and overuse of forage in local areas.

The summer of 1956 was extremely dry and the livestock water problem became critical. Temporary sump ponds were dug along Thorn Creek to prolong the dwindling water supply. These finally went dry and the additional demands on the charco-type ponds soon drained them dry. This left only Rattlesnake Spring which, even with its steady flow, could water no more than 100 head of cattle. The remainder of the stock had to be taken to the home ranches.

Fredericksen and his group were not to be caught again in the same predicament. Before the dust had settled, they were plotting the next improvement called for in the conservation plan—a well.

After careful study they decided

to build instead a 900 acre-foot reservoir. This was completed in the fall with assistance from SCS engineers and in consultation with Idaho Fish and Game Department officials. The large size of the development was dictated by several facts: (1) The runoff was erratic so that good water years would have to provide adequate storage for possible poor years; (2) the dam site was ideally suited for a

high fill which made it possible to take advantage of a natural spillway; and (3) the pond would make good habitat for fish and game birds since it would back water about a mile upstream from the dam.

When the dam was completed a cooperative agreement was made with the Idaho Department of Fish and Game which provided for public access roads, camping facilities, and stocking with trout. Fortunately, runoff from heavy rains completely filled the pond during the first year. It was stocked with legal-size fish and fishing was excellent the first year. Livestock water is no longer a problem.

The determination, cooperativeness, and willingness to invest in improvements shown by this group demonstrate what can be done when a group of stockmen work together. When a need arises, the only questions are: "How do we get it done and when can we get started?" No job, large or small, is neglected if it will do the range some good. One year they planted 1,000 trees by hand along the four-mile stretch of Thorn Creek.

Directors' meetings are held on



Crested wheatgrass, that was seeded by the Thorn Creek Association, shows up in rows among native needlegrass plants on range that once was mainly sagebrush.

the second Tuesday of each month to discuss such current problems as range riding, salting, bull program, and cooperative relations with other agencies. Most often they are laying plans for more range improvements. Traditionally, the meetings of the Thorn Creek group are held at the home of Don Fredericksen.

Other board members of the Thorn Creek Association are Don Sandy, president; Cliff Stutzman, secretary-treasurer; and Zern Mull and Everett Sant, directors. Harry Patterson has been employed as range rider for several years.

The secret to their steady improvement in range condition is annual deferment, proper harvest

of forage over a relatively short period, and good distribution of livestock. Presently they are able to graze around 1,400 head of cattle for two months and improve the condition of the range each year. This is good production since more than half the grazing land is on shallow and stony range sites. Only about 500 acres were seedable.

Latar Orchardgrass

By Edwin O. Nurmi

IT'S news when the cows in a pasture will eat one variety of orchardgrass with relish, and not eat another variety in the same field. This selection of one variety over another by grazing animals is a rare occurrence. Yet, that is what has been happening recently on several farms of the Pacific Northwest. The highly palatable orchardgrass is called Latar.

William Cranston, in the Kootenai Soil Conservation District in northern Idaho, is one of 35 Pacific Northwest farmers who have field plantings of this new variety. His cows preferred to graze the Latar-Ladino clover half of a field, while the forage was always eaten less on the commercial orchardgrass-Ladino clover part.

Cranston says, "My cows showed a 10-percent increase in milk production when turned in on Latar. Latar does not show spots of excess nitrogen as much as commercial orchardgrass."

Scientists at Washington State University, working with the Soil Conservation Service Plant Materials Center, were curious to know if this new grass had some chemical difference that made it taste better to the cows. Sure enough, after the

tests were completed, Latar proved to have the lowest lignin content of all orchardgrasses tested. It had a lignin content of 6.2 percent compared to 7.8 percent for a commercial strain.

Latar had a long journey before it found its place on Northwest farms. Seed of this orchardgrass was sent to the United States by the Westover-Enlow expedition in 1934. The sample was given to the expedition by the Institute of Plant

Industry, Leningrad, U.S.S.R. Seed samples secured by the expedition were distributed to various locations in the United States for comparative testing.

In 1935, a spoonful of this orchardgrass seed, then labeled PI-111,536, came to the SCS Plant Materials Center at Pullman, Wash. It was planted in a single short row to be compared with several thousand other grasses. That put it in a race for survival. By midsummer,

Common orchardgrass on the left is maturing and turning brown, while Latar orchardgrass on the right is not headed out and is still green.



Note:—The author is superintendent, SCS Plant Materials Center, Pullman, Wash.

a dozen plants had emerged in this 20-foot row. Plant scientists carefully measured the height and the seedling vigor of the new plants. Were they better than the grasses we now use, or about the same, or were they inferior? How was this new grass going to be rated?

Its future was doubtful, for most of the plants were weak and sickly looking, and only a few were strong and healthy. After the second year of full growth, these few plants still looked strong and robust. The scientists noted that the plants were exceptionally leafy and that they matured late. It appeared that this new strain might be an exceptional orchardgrass.

Further testing was scheduled. The grass was kept under observation for winter hardiness, disease resistance, forage production, and seed production. After several years of observation, seed was taken from the most desirable plants, and planted in a plot for further testing. This was repeated several times until in 1947 approximately 500 individual plants were started in the greenhouse and space-planted in the field for comparison with individual plants of commercial orchardgrass. After two years' observation, small and off-type plants were discarded, and the 1950 seed was bulked from the remaining plants. From then on, the selection was called P-2453 (accession number of the Plant Materials Center in the Western States).

But the testing had only begun. How would it do in the field, and how would it react under irrigation? All these questions and many others had to be answered before the grass would find its place.

Starting in 1951, P-2453 was planted in comparison with other orchardgrasses on Washington State Experiment Stations at Payallup, Prosser, and Pullman. Idaho and Oregon experiment stations also grew these grasses, and the western grass breeders studied them. Seed was increased at the SCS Center at



Commercial-type orchardgrass four years old.

Pullman so that farmers in soil conservation districts could make field-size plantings and compare the new variety with the orchardgrass they had been using.

Favorable reports began to come to SCS plant specialists about this new variety. It appeared to be winter-hardy, its production was good, the cows liked to eat it, and it was maturing about the same time as alfalfa for hay. Its forage yield at Pullman was found to be equal to the yield of common orchardgrass and superior to the yield of many varieties that farmers were growing.

The final test came during the winter of 1955-56 when orchardgrass seedlings suffered severe winter damage. Many well-known orchardgrass varieties were damaged, but P-2453 showed only slight injury and came through the winter as well or better than commercial strains.

By this time the plant scientists were convinced that this new grass was a superior variety. Latar was the name chosen, as it helped identify it as a late-maturing grass.

Latar was released in 1957 by the Washington and Idaho Agricul-



Latar orchardgrass four years old.

tural Experiment Stations and the SCS Plant Materials Centers at Pullman, Wash., and Aberdeen, Idaho, and in 1960 by the Oregon Agricultural Experiment Station and the SCS Plant Materials Center at Corvallis, Oregon.

Commercial seed production has been increasing during the past two years in Washington and Idaho. About 75,000 pounds of Latar were available for 1960 plantings. Even more seed should be available in 1961.

Highly fertile fields in irrigated areas and fertile, dryland areas of more than 18 inches of annual precipitation are well adapted to this new variety.

Latar joins the growing family of improved grass varieties with names ending in "ar" that have been developed at the Pullman Plant Materials Center. It took 23 years to rise from an unknown grass in Leningrad to the elite status of a registered variety. Latar's future looks bright. It will provide large yields of high-quality forage for dairymen and stockmen, and will give another boost to the growing seed industry in the Northwest.

They Farm the Bottomlands Again

on Johnson Creek Watershed

By Claude D. Crowley

YEARS of persistence in getting a program of soil conservation and flood prevention to check the creek's damaging ways is beginning to yield benefits on the 22,610-acre Johnson Creek watershed in western Tennessee.

Four new flood detention reservoirs, which can trap 2,792 acre-feet of runoff water, then release it slowly, are functioning on the upper reaches and tributaries of the sediment-filled stream. Rains which would have put the water out-of-banks in previous years now scarcely cause a rise. Downstream farmers are hopeful that the crop-drowning, scouring, sand-depositing high water which has driven them to abandon much of the fertile bottomland is a thing of the past. Several are cultivating downstream lands this year which would

have been extremely risky to plow only a year ago.

The first three dams, containing 149,544 cubic yards of earth, were built last summer at a cost of \$99,022.44. The fourth dam, containing 162,943 cubic yards of earth, was completed early this year, several months ahead of schedule. It cost \$69,218.86.

The Johnson Creek watershed project, as it nears completion, is an example of what local leadership and cooperation can do with Federal help under the Watershed Protection and Flood Prevention Act, Public Law 566.

Before passage of the small watershed law, there was little hope for improvement of the nearly intolerable conditions. Raw gullies covered over 1,638 acres of the upland. Besides being worthless for agricultural purposes, these gullies spewed thousands of tons of sedi-

ment into the sluggish stream with every heavy rain.

Years of this had the creek so silted in that even small rains caused damaging floods to the bottomlands. Sand drifts, several acres in area and as much as four feet deep, covered much of the best bottomland. In other places, sloughs were scoured out by the rampaging water.

Living near the mouth of the creek, and owning 250 acres of bottomland, Crawford Long was a keen observer of the unruly stream's damaging ways.

"We could count on losing about two or three crops out of five," Long said, "and harvesting about one good crop out of five. A two-inch rain upstream would cause a major flood down here."

Almost immediately after the passage of the small watershed act, the landowners applied for assistance.

"This was the first PL-566 watershed in Tennessee on which the SCS gave planning assistance," stated Clarence Daniels, conservationist for the Madison Soil Conservation District, "and we had little information to guide us. Some of the assistance we gave the watershed which took days to work out, now only takes hours."

After the watershed was organized under Tennessee State law, a Board of Directors was elected by the landowners. Major Fred T. Smith, whose grass and beef cattle conservation farm lies in about the middle of the area, was elected chairman.

Without funds, experience, or an example to go by, the directors went to work. "At that time, it just didn't look possible," Long

Note:—The author is assistant State conservationist, Soil Conservation Service, Nashville, Tenn.



Planting pine seedlings on a critically eroded area in the Johnson Creek watershed.

said. But encouragement and help came from all sides. The local newspaper and radio helped to tell the story. The conservation-minded county court appropriated \$2,000 to help the new organization get underway.

Even at this stage, however, many of the upland farmers were not convinced that the program would help them.

The first work done with Federal assistance did much to bind the upland and lowland farmers into a more cooperative organization. With \$35,250 of Federal aid, 1,410,000 pine seedlings were set on about 1,400 acres of gullied "critical areas." All of the trees were set by hand, using locally-hired labor. The upland farmers could see some promise in the gullied land for the first time. Something had been done. The problem of the idle, eroded land had been attacked.

Things were easier from then on.



A productive bottomland field covered with sand deposits in the Johnson Creek watershed.

In the spring of 1959, a contract for three flood detention reservoirs was awarded. In October, a fourth reservoir was contracted. The district plans to get the fifth and last structure started this year. About 15 miles of the channel will be

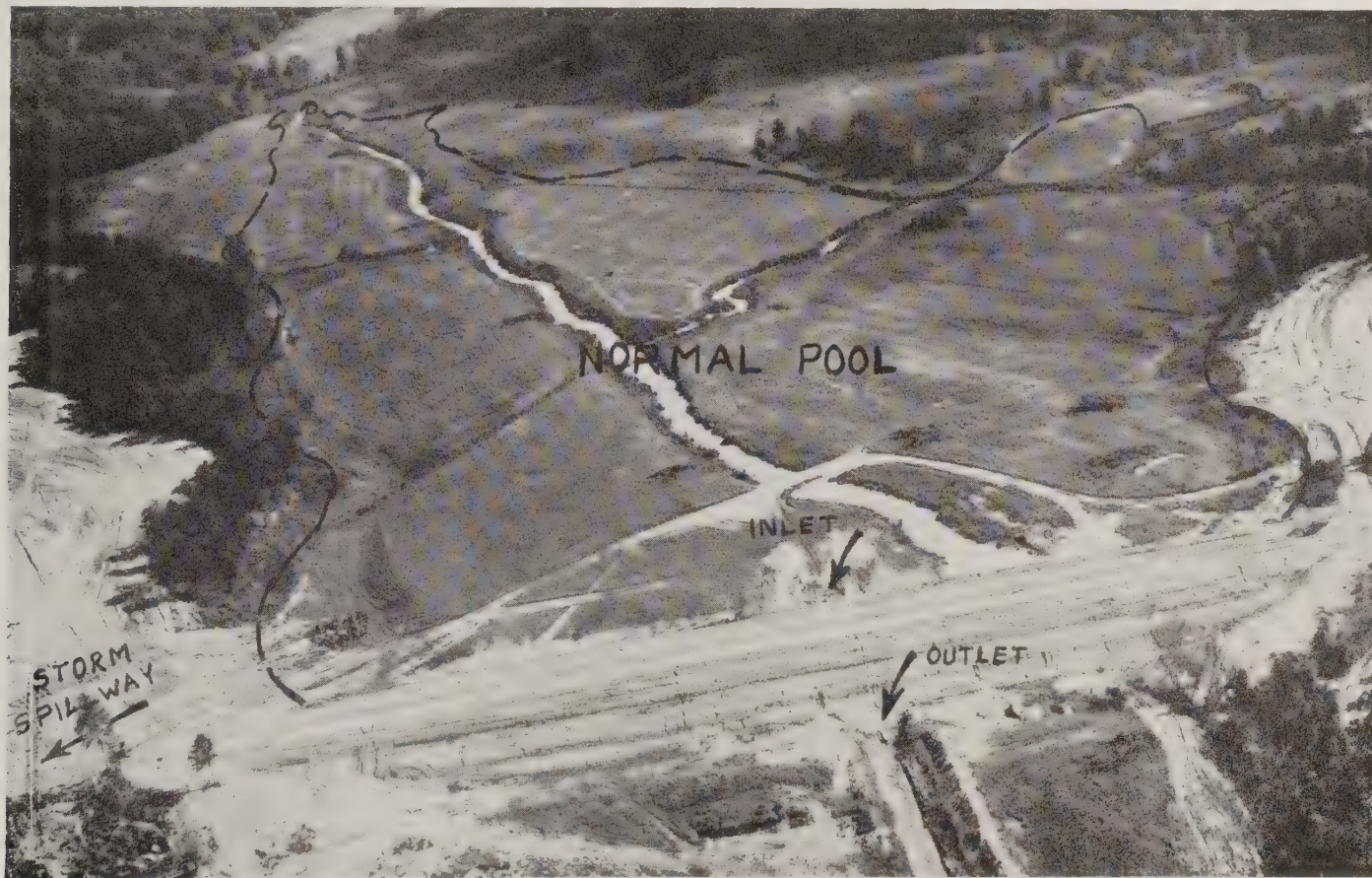
cleared as the final construction phase of the project.

When the construction measures are complete, even greater benefits are expected.

"I believe we are home free on the flooding," Long continued. "We didn't have a flood last winter. And all those tree seedlings on the upland gullies are bound to help hold back some of the water."

Besides the trees, the upland owners will enjoy the benefits of more water than they have ever had available before. Fishing, wildlife, and agricultural irrigation all stand to prosper.

Downstream farmers will be aided by the protection of their level bottomlands. It will be possible to follow better land use by moving row crops to the more fertile level land. It will now be practical to remove the sand without danger of having the land ruined after the next storm.



Aerial view of newly-completed floodwater retarding structure on Johnson Creek watershed.

Reclaiming Gravel Mines

By J. B. Earle

THE reclaiming of mined land on the State penitentiary farms in Sumter County, S. C., is an outstanding project.

Several hundred acres of land on the farm were leased to private contractors for gravel mining. In order to mine the area properly, several feet of the surface soil and soil materials have to be removed and piled to one side. Then several more feet of gravel and sand are removed and hauled away. When the operation is completed the area is a very rugged piece of ground piled high with mounds of earth. To look at it you would think it an almost hopeless task to ever smooth it out and reclaim it for agricultural use.

But the young, aggressive director of the farms, Guy V. Whetstone, is not easily discouraged. Then too, his long-range objective for these farms is "maximum beneficial use and conservation of all

the land and water." Not to reclaim these mined areas would be in conflict with this objective.

Since he is a supervisor of the Sumter Soil Conservation District and is following a basic soil and water conservation plan on his own farm, this objective has become a part of him—a way of life.

His efforts are bearing fruit on about 100 acres which he has successfully restored to usefulness. He is growing kudzu on some of the mined land, but most of it is planted to coastal bermudagrass. He produced 4 tons of hay per acre on some of the coastal bermuda during the summer of 1960, the second summer after the grass was planted.

Many more of the mined acres are in varying stages of restoration. He plans to use some of the mined areas for water storage for livestock and irrigation. In most cases the average level of a field is lowered 10 feet or more during the mining operations, due to removal of gravel and sand. There-



Gravel mining operations on the penitentiary farms.



After gravel mining was completed, the land looked like this.

fore, some of the areas are too low to reclaim for crops but are close to water-bearing layers of soil material which will provide the ponds with a regular supply of water.

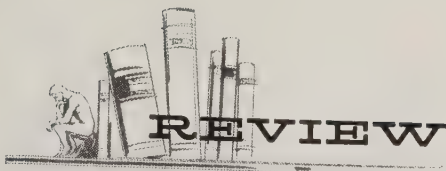
The mined land returns to the State a minimum of \$1,000 per acre from the mining leases. This is good business for the State. But it is also good business to reclaim the land and use it to grow coastal bermudagrass and other crops to help feed the more than 950 cows, heifers, and calves on the farms.

To cover these bare areas exposed to the rainfall helps prevent them from becoming a nuisance and converts them to usefulness at the same time. If not covered with vegetation, some of the bare soil would erode away and help to fill stream channels, farm ponds, and city reservoirs with silt or cover productive bottomland with sterile erosion debris.

Note:—The author is assistant State conservationist, Soil Conservation Service, Columbia, S. C.



Guy V. Whetstone (left) and J. F. Barron display coastal bermuda hay harvested on land recently mined for gravel.



LAND FOR THE FUTURE. By Marion Clawson, R. Burnell Held, and Charles H. Stoddard. 570 pp. Illus. 1960. The Johns Hopkins Press: Baltimore. \$8.50.

THIS is a book covering major components of land use in the United States—past, present, and expected.

The authors have brought together data from many sources which they liberally acknowledge. From this information they have drawn up some forecasts or predictions based upon certain assumptions. It is apparent that a thorough study has been made of available facts; yet the authors point out the dangers in making predictions.

With a fixed land base, a population of more than 300 million is pictured by the year 2,000. To accompany this population a gross national product four times as great as that of 1955 is expected along with doubled per-capita income and a shorter work week. These will all increase the demands for goods and services of land—for food, fiber, living space, recreation, highways, etc.

The authors point out that they favor no one land use over another, and they attempt to indicate expected needs for all uses. From the standpoint of agricultural and forest production they see no imminent shortage of land. They see continuing increases in per-acre output and technology coming up with answers which will provide an abundance of agricultural and forest products.

Acute local problems are acknowledged but no panaceas to resolve them are prescribed. Perhaps more could have been said

about proposed solutions—which would likely be controversial no matter how well presented.

Especially good are the chapters on land and space, urban uses of land, recreation, and land for grazing. Mention of these does not detract in any way from the others. There are good charts and tables and the book is well indexed.

The soil conservationist will agree with the statement, "There is no useless land. The ultimate resource is the resourcefulness of man." The reviewer would like to have seen more stress on capabilities of the land and on conservation treatment. Also, we wonder why more was not said about water as an integral part of the land problem. And we might wonder about the seeming optimism about the adequacy of land to supply future needs.

Yet, a vast, complex subject is covered in an interesting and understandable manner.

—JOHN W. BARNARD

FROM THEORY TO PRACTICE IN SOIL MECHANICS: SELECTIONS FROM THE WRITINGS OF KARL TERZAGHI. By L. Bjerrum, A. Casagrande, R. B. Peck, and A. W. Skempton. 425 pp. Illus. 1960. John Wiley & Sons, Inc.: New York. \$12.

FOUR experts in soil mechanics have compiled this large volume to present the life, bibliography, working techniques, and outstanding papers of their distinguished colleague, Professor Karl Terzaghi. Perhaps more than any other individual he has promoted both research and application in the field of soil mechanics in Europe and the United States. He was born in Prague on October 23, 1883. Thus his work went forward during a period of great need for soil mechanics if the increasingly large structures built on the earth were to endure.

Papers were selected to represent the period of his professional life. These include essays on the basic concepts of effective stress, surface friction, shearing strength, bearing capacity, and the like; as well as several on the application of these principles to varied practical problems, such as control and avoidance of landslides, problems of construction on frozen ground, tunneling in soft ground, problems of settlement, and the design of earthen dams and cofferdams. From these papers one can follow the progress of his professional development and of many aspects of soil mechanics.

This reviewer regrets that Professor Terzaghi did not lend his leadership to the correlation of soil mechanics with soil science, especially soil classification, so that the results of tests on soil samples could be given geographic expression through modern soil maps. But, of course, he could not be expected to do everything. This problem of correlation is being tackled earnestly and will be solved by soil scientists and engineers working together.

This book should be especially useful to younger men in soil mechanics. It shows how many of the theories they have learned were incubated and perfected. Certainly it opens up great vistas of application.

As we look forward to the great unrealized potentials of efficient water use and effective transport in an expanding economy, the significance of soil mechanics is very large indeed. Not the least among those who must understand and use its principles are those responsible for soil and water conservation.

—CHARLES E. KELLOGG



American farms use more electricity than is used in the cities of Chicago, Detroit, Houston, Baltimore, and Boston.

If your address changes, please notify us of your complete new address, including zone or RFD number, and include old address with our code number as shown above.

High Phosphorus Level Helps Beat Drought

Crops are more likely to come through dry spells in good shape if the available phosphorus in the soil is at a high level, according to Sterling Olsen, soil scientist at Colorado State University.

The drier the soil, the more difficult it is for plants to take up phosphorus. As a result, both lack of water and lack of phosphorus may limit crop growth and yields during dry periods, Olsen contends.

If the phosphorus level is high during moist periods, however, most plants will absorb more phosphorus than they need. When a dry spell comes, the plants then can draw on the phosphorus they have stored. This, combined with moisture pulled from the deeper—but generally phosphorus deficient—layers of soil, gives the plants a much better chance to survive drought periods.

Does Range Seeding Pay?

The Bureau of Land Management planted crested wheatgrass on 54,000 acres of publicly owned sagebrush-grass range throughout western Utah between 1952 and 1954. The average cost and returns from 20 seedings of this acreage, as figured by range specialists from Utah State University, were as follows:

Average total cost was \$18.51 per acre, which included costs of

brush removal, seedbed preparation, seeding, fencing, loss of grazing during nonuse period, and interest on investment during amortization. This represents an average annual cost of 93 cents per acre when amortized over a 20-year period. It does not include risks of failures, water development, or fence and water maintenance.

The calculated average annual gross return based on changes in carrying capacity and increased meat yields, when grazed by yearling cattle, was \$3.60 per acre more than returns from untreated areas.

Livestock Production on Southern Woodlands

Twenty years ago, in most areas, woodland grazing was associated with wildfires, overgrazing, large numbers of livestock running in trespass on other people's property, and extensive damage to the reproduction of important timber species. Nearly all large landowners, foresters, and conservationists joined the crusade to "get all livestock out of the woods."

Today, there is a growing appreciation of the economic importance of grazing as a secondary use of southern woodlands, provided the proper kind of livestock and timber management is used. Sound conservation planning is helping landowners determine which kinds of woodland are potentially capable of producing enough forage to

justify grazing use, when woodlands should be grazed, the grazing intensity that should be permitted, and the types of management necessary to make woodland grazing a profitable enterprise.

Much more remains to be done, but improved grazing management on thousands of acres of southern woodlands has shown that woodland grazing may be profitable; and has led to increased forage supplies, greater livestock production, and higher income and greater economic stability on farming and ranching units without greatly impairing timber production.

—ROBERT E. WILLIAMS

During the first 8 months of 1960, commercial slaughter plants of the U.S. processed 17,807 million pounds of red meat. This was 7 percent more than was produced during the same period of 1959.

The Livestock and Meat Situation report of October 1960 estimates that the number of cattle and calves on farms and ranches in January 1961 will reach an alltime record of about 105 million head.

The percentage of U.S. corn acreage planted to hybrids has been increasing steadily since 1933 when only 0.1 percent of the total corn crop was planted to hybrids. This year, 81 million acres of the total corn acreage of 84 million acres are in hybrid varieties.

FEBRUARY 1961

Soil Conservation



SOIL CONSERVATION SERVICE • U. S. DEPARTMENT OF AGRICULTURE



Growth Through Agricultural Progress

"The objective of conservation planning is a soil and water conservation program that coordinates the physical, economic, and human resources on the farm or ranch to achieve the highest personal goals of the land owner and operator, to benefit the whole community, and to meet the longtime needs of our Nation."

—DONALD A. WILLIAMS



COVER PICTURE.—A snow survey shelter on Baker Creek, Nev., that serves as a rest stop for snow surveyors measuring two courses on nearby Mt. Wheeler.

VOL. XXVI, No. 7

FEBRUARY 1961

CONTENTS

PAGE

- 147 Farm and Ranch Planning—The Base for Full Conservation
By Donald A. Williams
- 148 What Farmers and Ranchers Say About Conservation Plans
By Cal L. Roark
- 151 Basic Theory of Soil Conservation Plans
By Charles E. Kellogg
- 154 According to Plan
By J. G. Kennard
- 156 Farm Planning
By W. O. Lambeth
- 158 Report of the Administrator, Soil Conservation Service, 1960
- 165 From Cash Crops to Livestock
By Robert A. Hardin
- 166 Carl E. Hicks of Texas—A Profile
By Cleo Dark
- 167 Farm Donated to SCD
By Mitchell G. Hassler

Soil Conservation

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

TOM DALE, Editor

15 CENTS PER COPY

\$1.50 PER YEAR

FOREIGN—\$2.25 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Farm and Ranch Planning— The Base for Full Conservation

By Donald A. Williams

EFFECTIVE conservation of all our soil and water resources must be planned. Spur-of-the-moment action to meet urgent problems will never give us full and complete protection along with maximum use of these resources. The very complexity of the problems involved demands that carefully thought-out plans be made before extensive changes and conservation operations are begun.

We must have broad plans for the large agricultural regions and river basins of the country. We must have plans for the smaller watersheds and resource areas that integrate into the plans for these large regions or basins. These things are essential for an effective overall conservation program for the Nation. But even more important, we should have sound plans for the use and treatment of all tracts or parcels of land, large or small, because each tract—even each acre—may be different and require a different type of use or treatment. And it is on the individual tracts of land that most of our problems start—that is where the rain and snow fall, where the runoff and erosion begin, and where the production of our food, fiber, timber, forage, and wildlife originates.

Yet it is impractical to try to develop individual plans for each field or pasture of a farm or ranch while ignoring the developments on the other fields or pastures of that farm or ranch, because the farmer

or rancher must manage the entire farm or ranch as a unit for successful, economic operation. That is why we say that the farm or ranch is the basic unit on which conservation planning and application must begin.

It is true that a farm or ranch conservation plan is only the beginning and it is of little value unless the cooperator's decisions are carried out. But the importance of the plan lies in the fact that the needed land use changes and conservation practices seldom will be applied in the right way and in the right sequence without a good plan. That is why we must, as soil conservationists, stress the importance of sound conservation planning.

There is nothing wrong with applying suitable conservation practices one at a time, provided each contributes toward a coordinated program. In fact, most conservation programs are carried out by applying single practices, as they are needed; i.e., in accordance with plans. But the application of single unrelated practices may increase the conservation risks of a whole farm or ranch instead of solving the problems if they do not fit into a coordinated plan for the entire unit.

The conservation planning process is systematic decision making, based upon a logical evaluation of the alternatives for land use and treatment. It must involve a careful inventory of the soil and water resources and the collection of data

in a systematic form to determine not only the best practices from a conservation viewpoint, but also the economic consequences of all practical alternatives of use and treatment of the land.

There may be many different ways in which each tract of land may be used and treated successfully to conserve or improve it. Obviously it is not practical to consider each and every alternative for each plot of land on a large farm or ranch. But it is possible, and usually practical, to consider several alternatives for the farm or ranch as a whole. And the farmer or rancher should participate in developing, with the guidance of the assisting technician, the most practical, sound alternatives for use and treatment. Then he will be able to make a choice, in line with his desires and financial resources. He will be able to make a sound plan.

And that is most important of all—the fact that the farmer or rancher does have a choice and that the conservation plan is *his* plan, not an SCS plan. A good conservation plan is simply a record of the farmer's or rancher's decisions on how he will use and treat his land, after considering the alternatives with the conservation technician. If it is not the farmer's or rancher's plan, and regarded as such by him, we cannot expect it to result in sound conservation on the land.

What Farmers and Ranchers Say About Conservation Plans

By Cal L. Roark

HUGH Hammond Bennett told his listeners at North Carolina State College about two years ago: "Practically all farmers need the specialized scientific assistance of experienced technicians on the ground to help solve their more complex land and water problems. . . . In a sense, Soil Conservation Service technicians are land doctors, who have learned that half-way measures and improperly applied practices not only fail to get the job done but often do more harm than good over a period of years."

Certainly he has stated the viewpoint of the professional soil conservationist. But what do the farmers and ranchers think and say about the conservation plans that SCS technicians have helped them prepare and apply?

To Jess McGinley of Nebraska, "A conservation plan is a state of mind. It's like a big idea you have in your head all the time; and every time you fly over your range, or ride out on horseback, or put out salt, or do any other job you always have that idea in front of you, and you're looking around to see how you're fulfilling it." McGinley has a 33,000-acre ranch in Cherry County.

Frank Simler of Woodland, Idaho, who farms with his brother and father, explained: "A conservation plan ties up the loose ends and allows us to plan and have some hopes of carrying out our plans. It is something tailored to our needs and desires that helps us use our soil to the best advantage

and still leave good land to pass on to our children."

Klass DeWilde of Shiloh, one of the leading growers of ornamental nursery stock in New Jersey, considers a district conservation plan "of very great value." His reason: "It is best to put the practices on the land before trouble develops instead of trying to repair damage after it occurs. And because these plans have worked out wonderfully for us," he wrote the local SCS technician, "we will in the future, as we have done in the last 8 years, follow an overall (conservation) plan on all the farms we purchase."

Concrete evidence of the worth of a conservation plan induces landowners to stick to a planned program for their farmlands. J. T. Minchew, who operates his own 1,100-acre farm in Ware County, Ga., first became a cooperator with the Satilla River SCD in 1943 and has had his conservation plan revised three times to adjust to changing conditions. He says: "Since I have had a soil conservation plan on my farm and have used my land according to the plan, my corn yields have jumped from 10 to 127 bushels per acre, and tobacco yields have gone from 1,000 to 2,300 pounds an acre."

Most people acquainted with conservation farming now recognize that it is good business. Winton Palmer of Knox County, Ind., says that his planned conservation program has doubled his farm's value

in 10 years. Palmer believes that 90 percent of the land in that county that now changes hands is being bought by district co-operators. "They are the only ones with money to buy it. And they know what they can do with so-called 'worn-out' land when they get hold of it," he explained.

President W. E. Carpenter of the Farmers and Merchants Bank of Lineville, Ala., sized up the bankers' viewpoint with this comment: "We have found that less risk is involved when a borrower has a detailed conservation farm plan. A larger percentage pay back their loans on schedule. In fact, many of our borrowers in past years are now depositors and no longer need loans—a direct result of the wise application of conservation practices that were outlined in their farm plans."

ASC County Committee Chairman L. G. Caskey of Jacksboro, Tex., has observed that "farmers who receive the greatest and most lasting benefits from ACP cost-sharing are those who have a definite, longtime conservation plan and use ACP to help them carry out that plan."

Some people may doubt the value of a conservation plan. A fertilizer distributor in Indiana asked: "Can you really say that a farm plan has given you results?" George Gadson, Jr.'s reply before the group was: "Even a blind man can tell, if you'd let him feel the soil or let him walk over it." Gadson is chairman of the LaGrange SCD.

Robert Fain, of Felt, Okla., tells

Note:—The author is soil conservationist, Farm and Ranch Planning Division, Soil Conservation Service, Washington, D. C.

about conservation farming on his 3,432-acre ranch: "This has been a lifesaver to me. Before, I was overworked trying to get everything done, managing my cattle and grass and trying to keep my cropland from blowing. This Great Plains Conservation Program not only has helped me with my conservation job, but it has brought about a more efficient operating plan. I never realized that there was an easier and better way of doing things. It really fits our area."

Tony Krebs of South Dakota, writing for the NASCD Newsletter of December 1959, told of watching the building of a small business house for which the owner did not have an architect draw up a plan. As a result many parts had to be redone, some as many as four times. Krebs explained: "A farm or ranch plan is even more important. Damage to the land can be very costly before a man catches up with the mistakes of doing the right thing at the wrong time. A complete farm or ranch conservation plan is the way a farmer or rancher, truly wanting to do a conservation job, will go about it." Among several things he listed as advantages of having a conservation plan was this: "It gives a farmer or rancher a chance to grasp the full meaning of soil and water conservation, to understand the reasons behind every step he takes in getting his plan done. That is very apt to make him a real conservation farmer or rancher for the rest of his life."

Frank Thompson, a rancher near Helena, Mont., and a supervisor of the Lewis and Clark SCD, expressed a similar opinion about conservation plans in the District's 1959 Annual Report: "Would you build a house or barn without a proper foundation for the superstructure? A farm plan has this same relationship in the overall farm operations, rather than an unrelated topsy-turvy approach on one or two practices."

Many farmers find themselves

with land that is literally washing away, as did J. E. Ford of Amelia, Va., who in 1936 bought a badly eroded farm. Ford said, "After the first year of farming and a few heavy rains, I realized something had to be done to check the enormous loss of soil and water." Now, with a conservation plan in use, he explained that "soil losses have been greatly reduced, eroded spots have almost disappeared, and the yields have more than doubled."

To the fellow who moves into unfamiliar country to farm, a conservation plan can help him get off on the right track; without it, he can have a rough time for years. Take the case of Frank T. Morrow of McMinnville, Oreg., and the 1,316 acres he bought and came from eastern Oregon to operate. All but an 80-acre tract of bottom-land in crops was logged-over hill-land timber and he was getting poor results from his efforts to de-

PLAN YOUR FARM



FARM YOUR PLAN



velop it for pasture and range. Here's Morrow's own story: "I didn't know local conditions and was having a rough time until I developed a conservation plan five years ago with the help of the soil conservation district and the SCS technicians. My plan gave me an understanding of my soil and what it would grow best. I learned that I must become mostly a tree farmer rather than a rancher. My livestock now is a minor part of my enterprise and I am making real money on farming trees. That's what that hill land is suited for—not grass. Salvage logs and selected trees cut to improve my woodland stand have more than met the payments on the ranch, and income from the cropland is gravy. Before my plan I thought of the trees as only being in my way. Why doesn't everybody become a conservationist and use his resources to the best advantage?"

What does a planned conservation program mean to you? Eugene Blackketter of Leedey, Okla., is confident that he knows. Listen to him: "Conservation to me is a must. I have seen fields change from a grillwork of ditches to an orderly terraced field with no ditches, pastures with controlled grazing from a weedy exercise ground to a lush, succulent pasture. Proper conservation to me spells the difference between a history with no future and a history with a wonderful future."

Some landowners tell SCS technicians that their conservation plan makes the job of managing their farms much easier. Milton O. Reeves, of Madison County, Tenn., stated it simply: "My trouble in farming has always been that I could never do everything I needed to for a good job. But now my conservation plan helps me get ready for the job ahead. I can see what I need, when I need it, and how the job should be done."

A. O. Hamnes of Stephen, Minn., who runs a straight grain operation

in a five-year rotation on his 1,760 acres, expressed it a bit differently when asked if he liked his conservation plan: "Like it? I wouldn't be without it. It sure does cut down on the headaches in the spring. Now I know just where everything is going. It was a lot of work to figure it out in the first place, but it sure comes in handy."

Bill Crocker, a young dairyman at Georgia, Vt., stated his case briefly but to the point: "My farm plan helps me think ahead." So did Sherman Black of Yuma, Colo.: "A conservation farm plan gives you a new look at your farm." Another Yuma SCD supervisor, Bud Mekelburg, figures "The time spent in working up a farm plan is the cheapest and most worthwhile investment a farmer can make."

Several of the great people in America's early history, notably George Washington, wrote of the need for better care of the land. But until a comprehensive conservation plan for the entire operating unit is developed, many of the needed improvements are left undone and unrecognized. Such was the case on "Wessyngton," the large farm owned and operated since 1798 by collateral descendants of the first President. George A. Washington, present owner of the Robertson County, Tenn., farm, recalls that little was done in the way of scientific conservation until 1943, when a complete farm plan was developed with his local soil conservation district. Since then the land use has been adjusted and conservation treatment measures applied.

Tenants and landlords alike often express their appreciation for help received in conservation planning and application. For instance, three years ago W. W. McCoy of Ackworth, Iowa, wrote the Warren County SCD enumerating the benefits he had received. McCoy rents a 200-acre farm owned by a man from Topeka, Kans., who makes two trips a year to the farm. It was on one of these visits that they decided

to correct many of the problems arising from erosion and over-cropping. With the plan developed, McCoy wrote, "When we corresponded we used the plan; all fields were numbered and we referred to each field thus when planning farming operations or conservation projects. This plan made it especially easy for me to plan my operations ahead." And even with four years of drought, most of the conservation work has been done, benefiting, as McCoy put it, "the farm as well as me."

Thousands of young men first learned about soil conservation and the help they could get through their soil conservation districts when they were enrolled in GI farm training after World War II. A great number of them today are topnotch conservation farmers, although for many it was pretty tough sledding. Eugene Johnson of Wake County, N. C., is one farmer who spent the first five years after the war as a tenant before buying a 130-acre farm with only 15 acres of open land, "a considerable mortgage, and land and buildings in poor condition." But Johnson got the SCS technician he had met in the GI class to help him work out a satisfactory conservation plan; and he persevered in his efforts to give new life to abused, naturally heavy soils. "The original plan is almost completely applied now," Johnson explained. "It would have been impossible for me to improve my farm as I have without realistic plans. I have built a comfortable home and expect to pay my last major debt this fall."



More than two-thirds of last year's agricultural exports from the United States went to 14 countries. Largest importer of U.S. farm products was the United Kingdom. Others in the top five were Japan, Canada, West Germany, and the Netherlands.

Basic Theory of Soil Conservation Plans

By Charles E. Kellogg

THEORY and practice conflict far less than is commonly supposed. Good practice is in accord with good theory, either by accident or design. Where theory is lacking, we must fall back on the wasteful methods of trial and error. With good guiding theory, much of the waste can be avoided.

Research and experience of the past 25 years have led to some substantially sound theories on planning soil and water conservation programs for farm and ranch operating units. These operating units are "firms" in the business sense. The manager needs to deal with individual parts of his tract differently, yet each part influences the choices he makes about the other parts. The choices among alternatives are so many and so complex that few can make orderly decisions without a written plan.

The knowledge we have gained over the years about the potential behavior of the kinds of soil shown on a soil map serves as one important basis for the conservation plan of an operating unit.

The most effective plan must provide for significant sustained production—for efficient use of the soils to obtain an optimum level of productivity.

Although some of the dark-colored soils of the Corn Belt are highly productive for grain crops when first cultivated, most soils are not. And the highest yields of grain are more commonly found on arable soils of the eastern United States or of western Europe, which have been substantially improved

through use.

This potential for improvement is continually increasing. Not only can we get higher yields economically with the same soils that we have been farming, but also we can get economic yields on soils that were considered unfit for farming with the methods known a few years ago. Thus in modern agriculture the important question about soil productivity is not what a soil can produce in its present state, but how it can respond to management.

Each soil has many characteristics. Some are rather easily changed. For example, acidity can be corrected on most soils by liming; additional nutrients can be supplied by chemical fertilizers or in other ways. But other characteristics are difficult to change. Examples are steep or irregular slopes and thin rooting zones over hardpan or bedrock. But even these can be changed, and are changed in many crowded places where other growing factors are favorable.

No one soil characteristic exerts an influence apart from the others. The potential of any soil to respond to management is determined by the interactions among many soil characteristics. It is a fundamental principle in soil classification that kinds of soil must be defined as combinations of many characteristics. With some combinations, for example, small differences in slope may make wide differences in erodi-

bility. Soils with other combinations of characteristics are not highly erodible even on slopes of 30 to 40 percent.

Then too, the response of a soil to management is always a response to a *combination* of practices, interacting with one another and with the soil characteristics. That is, one must have the right combination of many soil characteristics and several management practices to get even a mediocre crop of corn. This principle of *interactions* is the most important principle of soil management.

A minimum of four broad groups of practices, in proper relationship to one another, are vital to a successful harvest. And every good harvest on every acre of arable soil in the world has resulted from a good combination of these four, either by design or by accident: (1) A proper balance of plant nutrients; (2) adequate supplies of air and water in the rooting zone; (3) appropriate crop varieties; and (4) adequate crop protection from insects, diseases, weeds, and other hazards.

These four broad groups of practices can be subdivided and added to in many situations. For example, we may build terraces to conserve water and, at the same time, to prevent soil erosion. On some soils special tillage, plantings, or structures are necessary to avoid soil blowing, catastrophic erosion, and other hazards.

The vital point is that the practices to reach all four objectives must be carried out at the proper

Note:—The author is Assistant Administrator for Soil Survey, Soil Conservation Service, Washington, D. C.

time to support one another on each acre. Otherwise really high outputs for the labor and materials used cannot be expected. This takes planning and scheduling. Few people can remember the details and carry them out for good success unless the plans and schedules are written down.

Let us consider a few examples of interactions. No benefit can be had from controlling erosion and increasing the nutrients in a soil beyond the limit of the water supply in the rooting zone or the genetic limit of the crop variety to respond. The most successful irrigation and drainage developments are those designed to *control* the water in ways that permit us to eliminate water or air as limiting factors. This means proper design of ditches and outlets and accurate leveling so that we may do a good job of water control. This is expensive. And the cost rarely is returned in good harvests, at least not for very long, unless plant nutrient deficiencies are also eliminated. And then we must have a variety that has the genetic potential to respond to this highly favorable soil environment. And the crop must be protected.

It is not uncommon to find statements about how much the production has been increased due to erosion control, to plant breeding, to insect control, to fertilizers, and so on. If all of these claims are added, we may get a figure several times the total harvest, with no allowance for the rain, the sun, the labor, or even the soil itself.

Experience with hybrid corn is a good example. Early hybrid corn spread rapidly on the fertile soils of the Corn Belt because the old varieties did not have the genetic ability to respond to the soil environment already available. But on soils of lower fertility hybrid corn did not significantly outyield the older varieties until additional fertilizers were used. Even yet we find people ascribing most of the increase in corn yields to fertilizers,

others to erosion control and soil building practices, others to the hybrid seed, and still others to machines. The point is that all were involved together and our high production could not be had if any one were dropped out.

Even some soil scientists have neglected the great importance of crop variety. We should recall that many of our plant varieties were selected over previous generations partly because of their ability to grow on poor arable soils. Through this selection process farmers had varieties that would make at least a fair harvest on infertile soils with bad water relations. But commonly in this process of selection the genetic ability to respond to a much better environment was eliminated.

I recall some experience in the Punjab of India. Here corn had been selected over many generations to grow on rather infertile soils that were often dry or waterlogged. With ordinary practices one could expect 25 bushels to the acre. An adapted hybrid would give about 28 bushels. With the soil under proper water control and fertilized the local variety would go to about 28 bushels—not nearly enough to cover the cost—while the adapted hybrid would produce around 100 bushels to the acre. Such illustrations could be multiplied no end.

Many roads lead to soil improvement. But all require planning. Fertility can be increased through growing legumes if they fit into the system otherwise. Manures and composts can be used. Green manures can be grown. But none of these practices is sufficient in itself; they contribute only when related to the soil and the other practices. The farmer is trying to develop a high quality arable soil. What to do depends upon what kind of soil he had to start with.

No practice in soil management has universal application. On soils with clayey subsoils likely to become massive under annual crops, the farmer may need to grow deep-

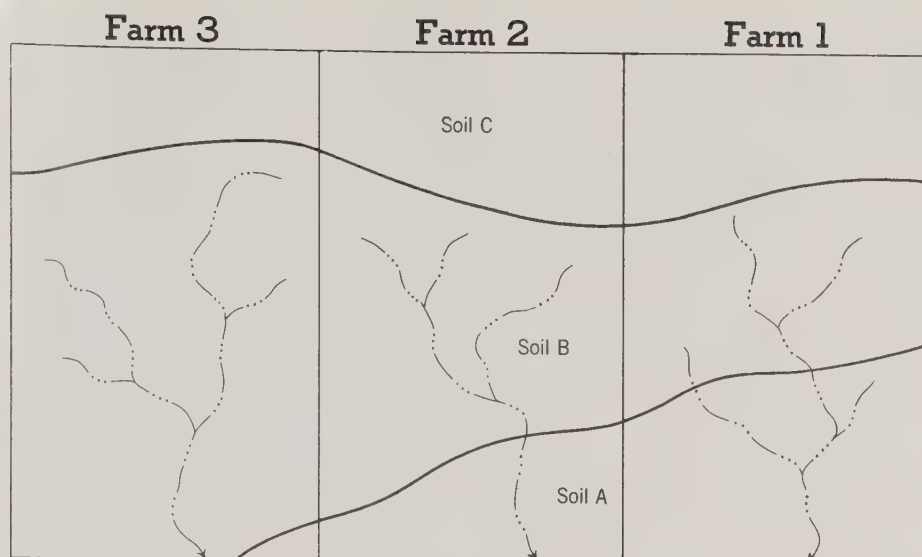
ly rooted perennials to maintain a deep and permeable rooting zone. On other soils this practice, although not harmful, may not be beneficial. We have soils that can grow corn continuously if properly managed; other soils may need to be placed under some kind of rotation that includes grass-legume mixtures, and so on.

In the United States many farmers have installed terraces of proper design. These have helped check erosion and resulted in more water in the soil for plant growth. But some of these farmers failed to include more fertilizer and closer plant spacing in their plans, and thus failed to get significantly bigger harvests from their terraced fields.

Besides these many interactions between soil characteristics and management practices on an individual kind of soil, each field on a farm influences the other fields. Thus one cannot make reasonably good farm plans without considering all of the kinds of soil in all the fields within the operating unit.

This principle is illustrated in the schematic diagram below, which shows three farms having varying proportions of the same kinds of soil. A proper determination of the use of each kind of soil depends upon how each fits into the whole farm unit. Hence, each farm has a different plan for the use of each soil. On nearly all farms both soil patterns and enterprise combinations are more complex than these.

We are repeatedly asked to suggest the “best” use for some particular kind of soil. Such a question cannot be answered in general terms except for unresponsive soils that have only one feasible use. Most of our soils have many alternative uses. That is why in our soil survey work we can rarely give recommendations. What we try to present to the user of the soil survey are the main alternative possibilities and what he may expect from these possibilities. But the selection from any one of these for



This schematic sketch of three farms in the humid, warm-temperate region with three kinds of soil illustrates how the use of any one soil depends on the others in the holding.

Soil A is an alluvial silty clay loam with good structure but slightly flooded and waterlogged in late winter or early spring. It is excellent for meadow, corn, or other summer-season crops. (Capability Class II).

Soil B is a strongly sloping Red-Yellow Podzolic silt loam of moderate permeability that is subject to erosion under clean cultivation. Among the broad alternative uses are: (1) corn and a legume-grass mixture in strips, with or without small grain in the rotation, but with terraces and grassed waterways; (2) small grain and a grass-legume mixture in strips without terraces but with grassed waterways; and (3) continuous legume-grass meadow without special water-control practices. (Class IV).

Soil C is a nearly steep lithosolic Red-Yellow Podzolic permeable loam that can be used only under permanent cover, either for woodland or for well-fertilized grass-legume meadow. (Class VI).

All these small farms of about 200 acres are adapted to mixed farming with livestock.

The operator of farm 1 can get high yields of continuous corn on soil A and use soil B for hay and pasture. He can sell some cash corn or enlarge his livestock enterprise by putting hay and pasture on soil C.

The operator of farm 2 can grow high-yielding corn on soil A and use part of soil B for hay and pasture in strips with small grain. He can use soil C for woodland or use it for hay and pasture and increase the small grain on soil B.

The operator of farm 3 has only enough of soil A for a home garden. He must use terraces and strip-crop soil B for both corn and hay. He must use soil C for high-yielding pasture.

Clearly the "best" use of soil B depends on the other soils in the farm.

a specific farm plan depends upon how the use of that soil area fits into the operation of the whole unit as a business.

Besides the interactions among practices within a field and the relationships among fields, several other influences affect the choices of alternatives and consequently the farm plan. First of all, the skill and personal preferences of the op-

erator are important. Certainly no one is going to help a farmer to develop plans for a dairy farm if he hates cows. Nor is one going to develop a plan for a complex horticulture farm for an operator lacking skill in that branch of agriculture.

Beyond the factors that lie within the farm unit, one also must think of the factors lying outside

of it. For most special crops a suitable market can be arranged only where enough local operators decide to grow that crop. Sugarbeets and cotton are examples of crops that require processing near the farm. This same principle applies to many kinds of vegetables and fruits that also require special processing and marketing.

Availability of credit and technical assistance has a lot to do with the kinds of planning that a farmer can risk or indeed can undertake at all. Many of us take some of the outside services for granted without realizing that they are developed unequally, not only among countries but among various communities in our own country.

The goal of most operators is sustained income. A big job in education has been to get operators to think in terms of several years, not simply the next one or two. In very few situations is there conflict between those combinations of practices that give the most income and those that maintain and improve the soil if the planning is done in terms of 6 to 12 years rather than one year.

In soil management the aim is not primarily for the highest yields. The aim is to get the highest production that we can for the labor, management, materials, and land used in production; that is, the highest net income to the farm family for its labor and investment. Under most situations this occurs at a yield level somewhat below the maximum that might be had by special, expensive measures.

The goals are individual. The farms and ranches are individual. The complexities are many. Guided by sound theory, a soil map, and knowledge of how the soils respond to alternative combinations of practices, an individual plan can reduce the complexities to practical terms for efficient operation. Only with such a plan can a system be developed that makes maximum use of the skills, labor, and investment of the operator.

According to Plan

By J. G. Kennard

THE Fonnesbeck brothers, Myron and Norman, are co-owners of a 1,250-acre farm near Weston, Idaho, which they operate on a partnership basis. They say that conservation farming has increased their farm output at least 50 percent.

The Fonnesbecks faced many problems when they took over the farm, 10 years ago. They had some poorly drained land as well as some good land. They noticed also that water erosion and low soil fertility reduced profits.

The brothers had become interested in the principles of soil and water conservation, so they applied to the Franklin Soil Conservation District for advice and assistance. The district supervisors turned the job over to the Soil Conservation

Service technicians working with the district.

SCS soil scientists had previously made a soil survey on all of the land in the district. The survey showed that approximately 900 acres of nonirrigated land on the Fonnesbeck farm was quite productive but that a large part of this area was deteriorating because of erosion and depletion of soil fertility. Approximately 40 acres of wet, salty land was producing nothing.

A complete conservation plan was developed for the entire unit.

One of the first corrective measures taken by the Fonnesbeck brothers under this plan was to construct 1,000 feet of open drain and 1,000 feet of tile drain in 1953.

Tall wheatgrass was planted in 1954 on 40 acres of salty land which had been drained. "Ten acres of this land, which had produced

nothing before it was drained, yielded 2½ tons of hay per acre in 1959," Myron declared. "Then, in addition to 25 tons of hay produced on this 10 acres, the regrowth produced 2,000 pounds of clean tall wheatgrass seed which we sold."

Contour stripcropping was laid out and practiced on 181 acres of steep dryland in 1954. This area was kept under a stripcropping system until it was seeded to grass and alfalfa for hay production in the spring of 1957. According to the plan, this grass and alfalfa will remain until about 1962, when it will be 5 years old. Then the fields will again be laid out for contour stripcropping which will include strips of grain, fallow, and alfalfa and grass.

According to the Fonnesbeck brothers' plan, all of the nonirrigated cropland will be in soil-build-

Note:—The author is work unit conservationist, Soil Conservation Service, Preston, Idaho.



Norman Fonnesbeck feeding a part of the dairy herd on the Fonnesbeck farm.



Myron and Norman Fannesbeck examine their winter wheat planted with a deep furrow drill in a stubble-mulched seedbed.

ing grass and legumes at least one-third of the time. As part of this crop rotation plan, 40 acres were seeded to sweet clover in the spring of 1958. Two hundred pounds of available phosphate per acre is applied on all newly seeded grass-legume crops.

The Fannesbecks always use grass with alfalfa in their hay mixtures on irrigated land. "Grass-legume mixtures provide a better quality hay and are more effective than alfalfa alone in preventing erosion," Norman explained.

The Fannesbecks have a grade "A" dairy enterprise which is developing rapidly in both size and quality. A milking parlor was built in 1954.

These conservation farmers do not like to invite erosion by letting their land lie bare during the winter. A chisel-type implement of their own design is used in the fall on all stubble fields to leave the straw on the surface. This chisel opens up the soil 8 to 10 inches deep so that the water is absorbed, thus preventing excessive runoff and erosion.

"Stubble mulching, along with subsoiling, grass and legumes on steeper slopes, and systematic crop rotations, not only conserves soil

and moisture, but also increases yields," declares Myron.

Thirty-three pounds of available nitrogen per acre was applied in 1956 on 105 acres which had been tilled with the homemade subsoiler. There was a heavy straw mulch on the surface. After applying the nitrogen, a rotary hoe was used to break up the straw. This was followed by using rod weeders during the summer, as needed, to keep the land free of weeds. This land was planted to winter wheat and produced 37 bushels per acre in 1957. Average yields in this area are 20 to 22 bushels per acre.

The Fannesbecks explain that the stubble they leave on the surface conserves moisture and helps to maintain organic matter. The application of nitrogen is important on heavy stubble mulch, they say, because much of the available nitrogen is used in the process of decomposition.

Harrows have been discarded by the Fannesbecks on dryland because they say that harrows pulverize the soil too much.

Deep furrow drills are used exclusively for planting their grain. They explain that seed wheat can be placed down into the moisture without burying the seed too deep

with this type of drill.

By improving their conservation program, the Fannesbeck brothers have been able to operate more efficiently and raise the crops of their choice. They have increased the production of forage crops so that they have been able to enlarge and improve their dairy enterprise.

This increased production has enabled them to invest in the modern machinery needed. They now have three tractors, a combine, two rod weeders, one rotary hoe, a mower, a subsoiler, and deep furrow drills. They also have a modern, 320-gallon milk cooling tank, a milking parlor, and modern feeding equipment. With this modern equipment the brothers do all the work on their 1,250-acre farm.

Myron served four years on the board of supervisors for the Franklin district. He now is serving as a member of the Franklin County ASC Committee.

The brothers were winners of the Idaho Grassman of the Year award of the Preston Chamber of Commerce in Franklin County for 1959, because of their outstanding accomplishments and progress in carrying out a planned conservation program.



In a University of Nebraska experiment, vegetables in plots protected from north and south winds by snow fence windbreaks out-yielded those in unprotected areas by 16 percent. Wind velocity in the lee of the windbreaks was reduced 50 to 70 percent. The early tomato harvest in protected areas was 16 tons per acre as compared to 10 tons in open areas.



A rain of over 5 inches at Hayes, Kans., left stubble-mulched soil, bone dry before the rain, wet down to 27 to 30 inches. Bare tilled soil was wet only to a depth of 12 to 18 inches.

Farm P

By W. O.



Robert J. Bowers, a farmer in Lee County, N. C., signed up as a cooperator with the Upper Cape Fear Soil Conservation District and asked the district to furnish him help in developing a conservation plan for his farm. The district supervisors requested the Soil Conservation Service technicians working in the district to give Mr. Bowers the desired help.



The first step toward developing the conservation plan was to make a detailed soil survey of the farm. W. I. Shope, SCS soil scientist, made the soil survey. In the picture at upper left, Shope discusses soil characteristics with Bowers while the soil survey is in progress.

With the soil survey completed, J. G. Olive, SCS work unit conservationist, brought a copy of the soil and capability map to the farm and helped Mr. Bowers develop a conservation plan. In the picture at left center, Olive discusses with Bowers the various alternatives for land use and conservation practices to fit the soils of the different fields.

After the conservation plan was completed, I. F. McKinney, SCS soil conservation aid, helped Mr. Bowers establish some of the conservation practices that required special technical skill. In the picture at lower left, McKinney points out to Bowers the location of a special practice and explains how it should be installed.

In this way, Mr. Bowers became a conservation farmer with a basic conservation plan, which he follows in all his farm operations.



Note:—The author and photographer for this picture were W. O. Lumberton, N. C. This group of pictures, with captions, was prepared by employees in North Carolina for the best photograph.

Manning

Lambeth

W. H. Mills (right) is manager of a nursery owned and operated by the Riegel Paper Company in Robeson County, N. C. The paper company is a cooperator with the Pee Dee-Cape Fear Soil Conservation District. W. P. Elam, SCS work unit conservationist, is shown here pointing out an area on the soil and capability map that needs special treatment, as he and Mr. Mills discuss features of a conservation plan for the nursery.



Paul Gerald (right), a farmer in Columbus County, N. C., is signing his newly completed conservation plan and cooperative agreement with the Lower Cape Fear Soil Conservation District, while F. M. Glover, SCS work unit conservationist, looks on. This agreement had been signed previously by the chairman of the board of supervisors of the district.



James D. Bellamy, Jr., (right), a supervisor of the Lower Cape Fear Soil Conservation District in North Carolina, is discussing revisions of his conservation plan with Hugh F. Kizer, SCS work unit conservationist. Mr. Bellamy's conservation plan was first written in 1945 and he has been following it ever since, but he finds that the plan needs revision occasionally, as agricultural technology advances.



The story is area conservationist, Soil Conservation Service, ons, won an award in Statewide competition among SCS e, essay of 1959.

Report of the Administrator

Soil Conservation Service

1960

IN this dynamic age, with breathtaking advances in science and technology and an exploding population, we should try not to forget the fundamentals of conservation that must underlie the wise use of our soil and water resources. We must keep in mind that the proper use and treatment of land and the water associated with it calls for our best efforts in applying the sciences of soils, agronomy, forestry, biology, hydrology, hydraulics, and related fields in a coordinated program, as called for by each specific situation—that any resource conservation program is only as sound as the technology on which it is based.

Yet, we must also recognize the fact that the people who own and use the land hold the key to conservation progress—that conservation is not achieved by dictation but by people exercising freedom of choice, usually motivated by the opportunity to better their way of living.

The greater part of our soil and water conservation work will be done on the farms and ranches of the Nation by the farmers and ranchers who operate those units. That is where the major efforts must be directed.

But the nonfarm beneficiaries of soil and water conservation and watershed protection now outnumber

farm and ranch people by about 9 to 1. The ratio apparently is widening year by year. This fact should have at least two meanings for soil conservationists.

It means, first, that our responsibilities are broadening. We need, more than before, to consider the needs and desires of the nonfarm population in the soil and water conservation program. As soil conservation districts broaden their concepts of responsibility to their communities, we may find them requesting more and more technical aid for conservation work of primary benefit to nonagricultural interests.

A second implication is that a more intensive informational job may be needed. Many of the nonfarm beneficiaries of soil and water conservation are unaware of their stake in conservation and their responsibilities for it. It isn't enough that they be merely passive recipients of conservation benefits. They, like the farmers and ranchers, will lend their support and cooperation to the conservation movement mainly as they recognize its importance to them.

We know that on each farm or ranch there are alternative uses for land that may be equally productive, assuming that proper combinations of conservation treatments are used. In a like manner, there may be equally desirable alternative uses for land in the total picture—as food- and fiber-producing

fields, as watershed areas, as recreation space, as transportation lanes, or as living, working, and playing room for our expanding population. Some areas may be suited for multiple use. For example, an area might well serve for timber and wildlife production and at the same time be a valuable watershed and recreation area. In the main, however, most of our primary needs for land space are competitive. It is hard to visualize a field being used for food crop production while also serving as space for an industrial plant or highway.

Yet, choices must be made as to how we are going to use the total land space. Many such choices must be made now or in the immediate future, especially in areas near great population centers. Some of the choices we now make may be irrevocable. We cannot wait until the pavement is laid on all the needed highways and airports, until a decentralized industry has built all its plants and appurtenances, until the urban sprawl has expended itself, to make the plans for the wisest use of our limited land space. If the country is to make sound decisions about which lands are to be saved for future agricultural production and which are to be used for the multitude of competing purposes, we must have sound land-use planning at the local, regional, and national levels.

Note:—This article is a digest of a report for the fiscal year 1960 submitted to the Secretary of Agriculture by Donald A. Williams, Administrator of the Soil Conservation Service.

And again, the land-use planning cannot be done effectively by dictation. It must be done largely by persuasion—by convincing the land users and potential users that long-term planning is best, and eventually will be beneficial to them. There may be many seeming conflicts of interest between various types of land users, especially between agricultural and nonagricultural users. A suitable solution for such seeming conflicts usually can be found, however, if the advantages and disadvantages of all alternative uses are fully understood by all people involved.

All this means that a successful conservationist today must not only be a sound technician in his field, but also must be a student of human relations and be informed about the sociological changes that are coming so rapidly. He must understand that the people who own and use the land exert the dominant influence in determining the what and how of a conservation program—that they must make the choice as to which land is used for highways, airports, suburban homes, recreation parks, agricultural production, and other purposes. And they make the choices about what kinds of conservation treatments are applied to the land. But the people concerned must have correct information in order to make wise choices in these matters.

Soil conservation districts and other conservation agencies have done an excellent job during the past two decades in educating agricultural land users about good land use. In many communities they have done an adequate job of informing the nonagricultural population about their stake and responsibilities in the conservation program. It seems that the best job usually has been done in communities with acute problems that affect both farm and nonfarm people, especially where water or watershed problems are involved. Some

of the best overall community land use programs have evolved from town and country people getting together to solve their mutual watershed problems. In fact, the small watershed program of recent years has probably done as much or more to bring farm and city people together as any other specific program. But much remains to be done about informing our great nonfarming population of their stake in the soil and water conservation program.

The Soil Conservation Service has been delegated wide responsibilities in the resource conservation program. A principal responsibility is still the furnishing of technical assistance to individual farmers and ranchers cooperating with their local soil conservation districts. But working with local groups and organizations on watershed protection and other community problems is becoming of more and more importance. And the welding together of all the various programs into an integrated program that deals effectively with all the problems is becoming more important as the complexity of present-day problems increases.

The following pages recount some of the progress made during the past year in the various fields for which the Service has responsibilities.



Soil Surveys

Progress in all phases of soil survey work was made during the year. The general response of the public in the use of soil survey information was particularly gratifying. Perhaps a major new interest has been in the engineering interpretations of soil surveys. Of course, the opportunity to use soil surveys in developing highway plans and in other

structural fields has been there for a long time; but the interest in their use is now growing phenomenally.

People generally now accept the basic facts displayed in soil surveys. These facts are no longer controversial. But the interpretations of the soil survey information are sometimes controversial because of the wide variation in purposes for which the surveys are used. This is especially true in urban areas where soil information is used primarily for county or community planning and zoning. Soil interpretations also may change in agricultural areas as technology, economic conditions, and power developments change. But the basic facts presented by the surveys will not change and should always be available for reinterpretation as needed.

Soil Survey Operations—Field soil mapping covered 50,159,493 acres during the year, compared to 48,030,068 in 1959. This is an increase of about 4 percent and is mainly the result of improved management and scheduling of soil surveys.

Standard soil surveys are being made in 1,964 areas. Of these, 841 are progressive. Soil surveys, not yet converted to standard, are being made in 923 areas. In these areas soil conservation surveys are being made mainly to satisfy the soil information needs for farm and ranch planning.

More than 658 million acres have been mapped in the United States as of June 30, 1960, with sufficient detail for use as base data in conservation planning of farms, ranches, watersheds, and for other purposes. This is more than one-third of the total land area of the United States and about 53 percent of the agricultural land in soil conservation districts.

The Service has been assigned responsibilities for planning and placing in a state of readiness a nationwide system for the radiological monitoring of agricultural lands and waters, livestock, and farm commodities on farms, ranches, or at bin sites in case of nuclear attack. This assignment includes the post-attack use of radiological information to determine circumstances under which lands may be returned to production and the farm produce and commodities safely used.

The Service has been assigned 1,320 fixed Federal monitoring stations. In gearing up to man these monitoring stations, instructor training was provided by an Agricultural Research Service-Office of Civilian Defense Mobilization team to all State soil scientists, the principal soil correlators, and 5 members of the Washington staff.

The State soil scientists, with help

from OCDM and ARS field offices, have trained 492 SCS people as radiological monitors. This type of training will be speeded up in fiscal year 1961 as equipment is made available to the States for monitoring.

Soil Classification and Correlation—Field mapping was initiated during the year in a number of areas where soils had not been studied previously. During the year, 37 tentative soil series were established and 72 dropped after a period of testing. Beyond that, 52 series established earlier were placed on the inactive list because of conflicts with other series or because they were not clearly defined. The total number of established and tentative soil series in the country remains near 7,000.

A project was started during the year for placement of selected information about individual series on punch cards as an aid to classification and correlation. Interest in this approach was indicated in a number of places in this country and also by soil scientists in other countries.

Work continued on the revision of the nationwide system of soil classification. During the year, further trials were made in the grouping of series into classes in higher categories. A report describing the revised system was prepared during the year and issued as the 7th Approximation of a revised classification system.

Soil Survey Interpretations—Twenty-seven edited soil survey reports with accompanying map materials were sent to the Government Printing Office during the fiscal year. Thirty-eight reports and maps were published, leaving 52 in the Government Printing Office at the end of the year awaiting publication.

Most soil survey reports now contain engineering interpretations of the soils, in addition to the usual land capability interpretations. Of the 52 reports in press, 29 contain engineering test data and others contain engineering interpretations.

Four of the reports published during the year and 12 of those in press contain descriptions of range sites and a list of the soils in each site. Fifteen of the reports in press contain interpretations of the soils in terms of woodland suitability groups. Several reports contain interpretations useful in urban planning.

Plans call for all future soil survey reports to contain soil engineering interpretations and woodland, range, and other soil interpretations where they are important. Improved climatic interpretations also are being placed in soil survey reports.

A new map legend was added to recent soil survey reports. This legend helps

the map user to go directly from the symbol on the map to the page in the report where the desired information may be found.

Considerable progress was made during the year on correlating capability groupings between States. The Northeast has completed the correlation of the capability groupings between States within that region.

A detailed study of the use of published soil survey reports was completed. Most of the respondents in this study were reasonably well pleased with the form and content of published soil survey reports.

Soil Survey Investigations—Physical and chemical studies for characterization of the soils of the United States continued at a slightly reduced rate. Increased emphasis was placed on studies of soil profiles to improve the knowledge of soil genesis, and to improve the soil classification system. Field studies were made of soils of Hawaii and Puerto Rico to bring about a better classification for soils of tropical regions.

Investigations in cooperation with the U.S. Plant, Soil, and Nutrition Laboratory have been completed on cobalt deficiencies in the Southeastern States, and are nearing completion on molybdenum toxicity in Western States.

The World Soil Map Group extended its basic soil mapping in several countries. Major emphasis continues on new interpretations of both new and old mapping. Compilation of a new 1:5,000,000 general soil map of the United States has continued in terms of the new soil classification system.



Plant Technology

During the year there were many instances of progress in the various phases of plant technology, especially in the broadened demand for technical assistance by rural landholders, the refinement of standards and specifications, and coordination of practices across State lines. A few random examples of progress follow:

Analysis and Coordination in Agronomy—One of the significant improvements during the year was the progress in analyzing the agronomic phase of the total Service program at area and State

levels. The analysis provides a good picture of the problems and needs in agronomy that require attention in order to improve conservation accomplishments on crop and pasture lands. Progress was made in the correlation of agronomic specifications across State boundaries where comparable soil and agricultural conditions exist.

Improved Windbreak Design—In the Great Plains a significant change has taken place in the pattern of field windbreak plantings. Instead of being planted in multiple rows, windbreaks often consist now of a series of single rows across a field, referred to as pattern-type windbreaks. Since this type of windbreak planting has been introduced, the increase in acres protected has been manyfold.

With the single-row pattern-type field windbreaks less land is taken out of cultivation; more acres are protected; the windbreaks are easier to maintain; the trees grow better; the cost per acre is less; and better wildlife protection is provided over larger areas.

Rating Soils for Wood Crops—One of the outstanding contributions to woodland conservation during the year was the progress in rating soils for the production of wood crops. West Virginia and Vermont had developed soil interpretations for woodland use a year ago; now this type of information is available for field use in Maine and New Hampshire and, within a short time, will be available in Massachusetts and Virginia. Studies began in New York State during June.

Approximately 1,500 observations have been made to date in the Northeast as a basis for this type of information, which is basic to the practical management of small woodlands as a part of soil conservation.

Biology in Rural Areas—During the past year more and more ruralites, as well as farmers and other landowners, asked for assistance in treating their lands for wildlife. In addition to farmers with specialized interests in wildlife, people with land but no inclination to farm requested help on varied and complex land use problems involving the application of biology techniques.

Combination marsh-ponds designed to provide fish, wildlife, recreation, and fire protection have been developed on a number of rural properties.

During the year there was a marked increase in requests for assistance in planning the land use layout of shooting preserves. Particular emphasis has been placed on determining planting patterns consistent with soil conservation objectives.

Livestock Production in Southern Woodlands—It became apparent during the past year that the Soil Conservation Service is playing a major role in bringing about an appreciation of the economic importance of grazing as a secondary use on southern woodlands. Twenty years ago woodland grazing was generally associated with wildfires, overgrazing, large numbers of livestock running in trespass on other people's property, and extensive damage to the reproduction of important timber species. Nearly all large landowners, foresters, and conservationists joined the crusade to "get all livestock out of the woods."

Today, assistance in conservation planning by Service technicians is helping landowners determine which kinds of woodlands are potentially capable of producing enough forage to justify grazing use; when the woodlands should be grazed; the intensity of grazing compatible with perpetuation of the forage crop and necessary protection to timber reproduction; the need for water developments and fencing to improve grazing distribution; and the kinds and amount of tame pasture and hay needed to supplement the woodland grazing on each operating unit.

Much more remains to be done, but improved grazing management on many thousands of acres of southern woodlands already has led to increased forage supplies, greater livestock production, higher income and greater economic stability, as well as better protection of the soil resources in the Southeast.

New Plants for Conservation—During the year a number of new plants were named and released for conservation use in the Western States. In the Great Plains, Garrison creeping foxtail, initially tested and increased at the Bismark, N. D., Plant Materials Center, was certified by the Wyoming Crop Improvement Association. It is coming into use in wetlands and irrigated pastures in Wyoming and Montana.

Holt Indiangrass, a Nebraska selection made by SCS in 1935, took its place, along with other native grasses, in permanent grass seedings. Eight registered seed growers are now producing seed of this grass.

Seed blocks of Vinall Russian wildrye, a superior cool-season strain, were developed cooperatively with ARS. Foundations were established at Bismarck, N. D., and Los Lunas, N. Mex. Registered seed growers in North Dakota and Nebraska Experiment Stations are producing seed.

Other promising plants in the West are Great Basin wildrye in Idaho and a strain of buffelgrass in Hawaii.

Seed harvesting techniques, including

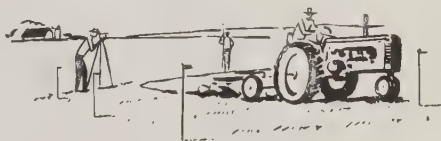
special machinery, have been developed for a promising new legume, *Desmodium intortum*, in Hawaii. Further improvements now in progress will result in spreading the use of this valuable legume as a needed companion of Pangolagrass.

In the East, new plants named and released included Clanton tickclover, *Desmodium perplexum*, a native legume from North Carolina having superiority in ease of establishment. It is used for wildlife food and cover, as well as for hay on land that is not suited to other legume hay crops.

A new crown vetch, Chemung N. Y. 669, was selected from numerous accessions at the Big Flats Plant Materials Center. Tall oatgrass, N. Y. 867, a late-maturing selection that coincides with the blooming date of alfalfa, was also developed at Big Flats. It is in demand for hay production on droughty soils in the Northeast.

Better Techniques for Establishing Conservation Plants—During the year the use of paper and fiber nets proved their usefulness in helping to stabilize bare, steep banks. Use of a coarse jute net showed that it could function as a kind of mulch, and a lighter paper net used to hold hay or straw mulch in place aided in the establishment of vegetation on raw cuts and fills. Both of these materials also proved valuable in protecting young seedlings in waterways until they were fully established.

Experience also indicated that seedings made at the base of slopes were especially effective in stabilizing steep shoulders and cuts on roadways. When fertilized and seeded to adapted grasses, strips planted across the lower part of a slope stabilized 10-foot banks in three years, when treatment started at the bottom and was extended up the slope in succeeding years. This inexpensive, simple method, used on secondary roads in Georgia, is spreading to other areas in the Southeast.



Engineering

The workload in engineering aspects of the soil and water conservation program continued to increase, mainly as a result of the stepped-up pace of the small watershed protection program. The training program for engineers was intensified during the year. Further handbook and guide materials were developed and design work was standardized as much as

possible to help speed up the work of the available engineers and aid in the training of new engineers. Progress in some aspects of the engineering work follow.

Erosion Control Practices—Considerable progress was made in obtaining uniformity in engineering surveys and recording notes on ACP practices for which SCS has technical responsibility.

Continued attention was given to the refinement of design criteria for terraces. Field trials on terrace spacing are in progress on selected soil areas in Illinois to evaluate different terrace spacings for cropping systems of varying intensities.

In Iowa selected fields with irregular topography were satisfactorily terraced by making cuts and fills along the terrace line. Terracing, though needed for protection of such fields, was not considered practicable under the previous concept of terrace construction due to the difficulty of farming terraces with extremely irregular spacing. Alinement was greatly improved by the cut-and-fill method.

In the Southeast, considerable progress was made in developing methods for efficient use of moderate-size equipment in the construction of terraces and waterways. This included a form of land leveling or smoothing ahead of terrace construction to achieve terrace alinement suited to large farming equipment. It is resulting in added acceptance of terraces by farmers.

Drainage—Progress was made in the practice of land grading and smoothing for drainage. Relatively flat fields normally contain small irregularities and depressions which pond water one to six inches deep after rains. Where the soil in the depressions puddles and the soil structure breaks down, drainage is impeded and crop yields are decreased. It has been demonstrated that on many soils it is feasible and profitable for the farmer to move a considerable amount of soil to grade and smooth his fields.

Soil conservation districts have played an important role in the spread of land grading and smoothing for drainage. Many districts have sponsored demonstrations of the practice. Thousands of farmers have become familiar with the practices through SCD demonstrations. In the Southeast there was continued interest in water control on wet woodlands to improve timber production. Many large companies are undertaking such work at their own expense with consultation from SCS technicians.

Progress was made in obtaining better quality drain tile. The American Society of Testing Materials issued a new specification for clay drain tile which includes

a class of tile known as "heavy duty." This will provide a tile up to 80 percent stronger than "extra quality" which was formerly the top grade. The "heavy duty" class is needed to provide safe tile in deep trenches.

A guide for the use of concrete tile in acid and alkali soils was developed. This guide establishes limits for different classes of concrete tile in acid and sulfate soils.

Irrigation—Work on PL 566 projects and special problems is taking an increasing amount of time of irrigation engineers because of the increase in the number of projects having irrigation features.

The last of the Case-Wheeler Projects, the Eden Valley Irrigation Project in Wyoming, was completed this year.

Service personnel continued to work closely with the American Concrete Pipe Association, Society of the Plastics Industry, and Steel Plate Fabricators Association in developing new standards for irrigation pipelines.

Continued progress was made in preparing adequate irrigation guides.

Hydrology—There was a significant increase in the demand for assistance in the hydrologic aspects of watershed planning and operations.

Plans were developed and work is progressing on the processing and analysis of data collected in the pilot and other gaged watershed projects.

Volume-duration-frequency computations were completed on a 26-stream pilot project. This type of information has been requested by many States to aid them in determining reservoir storage requirements. To date, approximately 9,400 station-years of streamflow records from New Mexico, Oklahoma, Texas, Kansas, Arkansas, and Louisiana have been processed by electronic computers to tabulate the annual maximum flow-duration data.

Snow Surveys and Water Supply Forecasting—A cost study of the snow survey program resulted in increased financial support of the program by cooperating agencies. The use of markers for air observation of snow depth was increased along with a 2-percent increase in snow courses during the year. A new electronic data-processing program was developed, and much of the snow survey and related data are being put on a standard form which can be used for printing summaries of data, analysis, development of forecast procedures, and making forecasts.

The trend continued toward issuance of a simplified forecast report to serve the needs of cooperators within soil conservation districts. This type of report has been adopted in 4 States and in part of 4 other States. Specialized forecasts involving the hydrographs of streams

were initiated to meet specific needs of some water users, depending on the type of water right.

Design and Construction—It became apparent during the past year that further study was needed on the design of sectional, reinforced concrete pipe drop-inlet barrels 28 inches or more in diameter. A survey of existing installations was initiated and it was found that ordinary tongue-and-groove-joint pipe with flat gaskets was not adequate in some installations.

The problem was presented to the American Concrete Pressure Pipe Association and the Association retained a consulting firm to make a study of the problem and prepare a report. This work is well underway.

Engineering services contracts were used to supplement Service design forces in handling the peak design load that usually develops in the spring of the year. Consultants were employed mainly on special or complex problems to provide guidance and advice and in some cases to prepare complete plans and specifications on complex or unusual problems. The Service improved the handling of such contracts in both the negotiation and operations stage; however, a Service engineer must still guide the work of the engineering firm and check their design computations and plans.

There was a significant shift of design work from regional units to the States. This trend will and should continue; it will be hampered, however, by a shortage of competent design engineers. This shortage can be expected to become more acute before it improves.

Geology—Notable progress was made toward improving the scope and quality of geologic data during the year. More States are acquiring better drilling equipment and sampling tools.

Close coordination was maintained with representatives of ARS on needs for research on specific problems related to geology. Arrangements were completed for an ARS staff member to inspect channels in the southeast and northwest areas to become better acquainted with channel stability problems encountered by SCS in the field.

Soil Conservation Districts

Since the primary job of the Soil Conservation Service is to provide technical help to farmers and ranchers cooperating with their local soil conservation districts, the Service continued to devote attention to working relations with districts. During the year a close review was made of operations in all districts with which the Service had memorandums of understanding. The General Accounting Office also

made a review in several States of the manner in which soil conservation districts conduct their business affairs and Service relations with the districts.

During the year 30 new soil conservation districts were organized; but 24 districts were consolidated with other districts or dissolved, leaving a net increase of 6 districts. At the end of the year there were 2,861 soil conservation districts established and 6 other districts being assisted by the Service in the 50 States, Puerto Rico, and the Virgin Islands. These districts contain about 1,671,973,000 acres. About 95 percent of all farms and 91 percent of the land in farms of the continental United States are now included in soil conservation districts. Memorandums of understanding had been signed with 2,848 districts, which include about 1,668 million acres and 4,604,000 farms and ranches.

During the year 112,607 farmers and ranchers operating 38,479,023 acres became cooperators with their local districts. At the end of the year 1,849,525 farmers and ranchers operating about 571 million acres of land were listed as cooperators with districts.



Farm and Ranch Planning

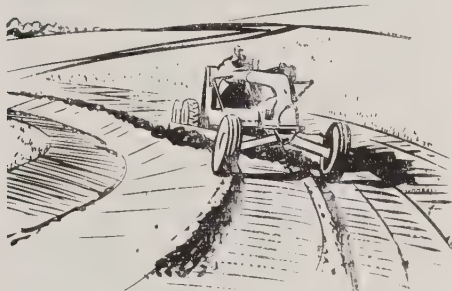
Soil conservation district cooperators developed 99,196 basic conservation plans, covering more than 32 million acres, during the year. This was an increase of about 7 percent over the previous year. In addition, 20,687 basic plans, covering nearly 12 million acres, were revised this year. At the end of the year, 1,301,450 farms and ranches, embracing more than 378 million acres, had basic conservation plans. Of this number, 209,838 basic plans had been fully applied at the end of the year.

Increased emphasis was given to basic planning this year. Also emphasized was the preparation of more adequate notes and records by technicians on the planning and application assistance given to SCD cooperators. Such records should be especially valuable in cases where the planning of a unit extends over a period of several months or more. The develop-

ment of more uniform technical guides at the work unit level also was stressed.

Pilot trials were started in 6 States to provide more accurate information on the costs and returns for alternative land uses and various combinations of conservation practices on different kinds of soil. This should result in giving SCS technicians better information to answer farmers' and ranchers' questions about costs and returns expected from various alternative uses and treatments of their land, and thus help them make sounder decisions about their conservation plans.

Rurban planning continued to receive more emphasis in districts near rapidly expanding population areas.



Land Treatment

Increased emphasis was placed on getting conservation practices applied to the land in accordance with a plan. Some time and effort were devoted to giving technical aid on individual conservation practices, especially where ACP cost-sharing was involved; but the main emphasis was on the application of practices that fitted into a coordinated land treatment program as specified in a basic conservation plan. The resulting progress for the year was gratifying. Special efforts were made to speed up the conservation treatment of land in all small watersheds approved for structural works of improvement.

Some of the more important conservation practices newly applied by SCD cooperators during the year include: 12 million acres of conservation cropping systems; 2.4 million acres of contour farming; 3.8 million acres of cover cropping; 10.7 million acres of crop residue use; 598,000 acres of stripcropping; 1.9 million acres of pasture improvement; 2.6 million acres of pasture planting; 2 million acres of rotation grazing; 38 million acres of proper range use; 15.8 million acres of deferred grazing; 1.1 million acres of range seeding; 910,000 acres of tree planting; 1.9 million acres of woodland improvement; 11 million acres of woodland protection; 436,000 acres of wildlife area treatment; 46,000 acres of grassed waterways;

34,000 miles of terracing; 266,000 acres of land grading and smoothing; 1.7 million acres of improved water application in irrigation; 1.2 million acres of drainage improvements; and 47,000 ponds constructed.

Watershed Protection and Flood Prevention

Watershed Protection (PL 566)—

Applications for planning assistance, under Public Law 566, were received from 171 watersheds during the year. At the end of the year, 47 States and one Territory had submitted a total of 1,319 applications for Federal assistance in watershed planning.

During the year 120 applications were approved for work plan development. This brought the total watersheds approved for planning to 566. At the end of the year, planning had been suspended or terminated in a total of 95 watersheds. These suspensions or terminations were at the request of the local organizations or with their concurrence.

The work plan parties authorized for 42 States were supplemented by the assignment of planning personnel to other States according to the planning workload. The Forest Service, Bureau of Land Management, and Bureau of Indian Affairs assisted with watershed planning where watershed problems required such assistance.

In eight States, additional non-Federal planning assistance amounting to more than \$1 million was provided through trust fund agreements, reimbursements, State-controlled planning parties, and personnel provided by States.

During the year, 84 projects were approved for "advanced engineering and other technical assistance" and 39 projects were approved for "construction of structural measures." This brought the total projects approved for Federal assistance in the installation of works of improvement to 264, covering about 15 million acres. Of those, 146 are approved for the "construction of structural measures."

Within the projects approved for works of improvement, about 54 percent of the total area is covered by SCD agreements and about 45 percent is covered by basic conservation plans. Soil surveys have been completed on about 66 percent of the total area of these projects.

The principal structural measures installed as of June 30, 1960, included 239 floodwater retarding structures and 178 miles of stream channel improvement.

Watershed Protection (Pilot)—There were 32 active pilot watershed protection

projects during the year. Federal assistance in 23 projects was completed prior to this year except for project evaluation and completion reports in some projects. Seven projects have been discontinued at the request of the local sponsors before completion of the planned measures. Ten additional projects were completed except for project evaluations and completion reports during the year. Fifteen projects are scheduled for completion in fiscal year 1961. Seven projects will be continued after 1961.

The principal structural measures installed as of June 30, 1960, in 58 pilot projects included: 299 floodwater retarding structures; 1,696 stabilizing and sediment control structures; 232 silt and debris basins; 269 miles of stream channel improvement; and 415 miles of roadside erosion control.

In addition, 15,864 acres of critical sediment-producing areas have been planted to grasses and legumes, and 10,972 acres have been planted to trees.

At the end of the year, 64 percent of the total land area in these watersheds was covered by SCD agreements; basic conservation plans were developed on 47 percent of the area, covering 54 percent of the farms; and soil surveys had been completed on 74 percent of the total area.



Flood Prevention—Work plans were prepared for 12 subwatershed areas during the year in the 11 authorized flood prevention watersheds. This makes a total of 182 subwatersheds and 16 subwatershed area work plans completed to date.

The principal structural measures installed as of June 30, 1960, in the 11 authorized watersheds included 956 floodwater retarding structures; 850 stabilizing and sediment control structures; 246 silt and debris basins; 1,355 miles of stream channel improvement; and 2,945 miles of roadside erosion control.

In addition, 142,218 acres of critical sediment-producing areas had been planted to grasses and legumes and 188,235 acres had been planted to trees.

In the subwatersheds where work plans have been completed, about 55.6 percent of the total land area was covered by SCD agreements and basic conservation plans had been completed

on 47 percent of the operating units covering about 43 percent of the area. Soil surveys had been completed on about 65 percent of the total area of the 11 authorized watersheds.

Emergency Measures—Six watersheds were given emergency treatment to prevent serious sediment and flood damage from forest fires during the year. A total of \$229,298 of Flood Prevention Emergency Measure funds were allocated for treatment of these areas.

River Basin Activities

Service personnel represented the Department on five Inter-Agency River Basin Committees, as follows: Arkansas-White-Red Basins Inter-Agency Committee; Missouri Basin Inter-Agency Committee; Columbia Basin Inter-Agency Committee; Pacific Southwest Inter-Agency Committee; Northeastern Resources Committee.

The Department is participating in several river basin surveys and investigations with other Federal or State agencies. The Soil Conservation Service, Agricultural Research Service, and Forest Service are the principal Department agencies concerned with these surveys and investigations, with the SCS member acting as chairman of the various advisory committees.

The principal basins involved in these surveys and investigations are: Delaware River, Potomac River, Lower Mississippi and tributaries, Yazoo-Mississippi flood plain in Mississippi, Kansas River in Kansas, Upper Colorado River, Cape Fear River, Upper Mississippi River and Great Lakes, Huron River, Upper Willamette and Deschutes Rivers, Bayou Bartholomew in Arkansas and Louisiana, Humboldt River, and Sevier River.

SCS representatives served as Department advisors to Federal members of 6 interstate compact commissions. These commissions are in the process of nego-

tiating interstate compacts on the Arkansas River by Kansas and Oklahoma; on the Arkansas River by Oklahoma and Arkansas; on the Red River by Oklahoma, Texas, Arkansas, and Louisiana; on the Niobrara River by Wyoming, South Dakota, and Nebraska; on the Carson, Truckee, and Walker Rivers and Lake Tahoe and tributaries by Nevada and California; and on the Wabash Valley Interstate Commission established by Public Law 86-375.

The Department provided data and other assistance to the U.S. Study Commissions for eight river basins in Texas and a group of Southeast river basins.

Great Plains Conservation Program

Farmers and ranchers entered into 2,048 contracts covering about 5,571,000 acres under the Great Plains Conservation Program during the year. Included in these contracts were more than 180,000 acres of planned cropland conversions and about 114,000 acres of planned range reseeding. Work was performed on all 24 conservation practices listed for cost sharing under the GPCP.

As of June 30, 1960, 352 counties in 10 States were authorized to participate in the program. In these counties, 4,935 contracts covering about 13,231,000 acres had been signed. Altogether, about 449,000 acres of former cropland are to be converted to range or other types of permanent vegetation under these contracts, and about 482,000 acres of rangeland are to be reseeded. An additional 3,084 applications, covering about 9,946,000 acres, had been filed at the end of the year.

Conservation Needs

The National Inventory of Soil and Water Conservation Needs was nearing completion at the end of the fiscal year. Most of the county and State committee

reports were completed and summaries received by the Departmental committee in Washington.

The Department Committee developed procedures for the review of State Inventories and some progress had been made in this respect. National results should be published in 1961.

The data for all counties in the United States by land capability subclasses for both present and expected land use is being put on punch cards for machine processing. Thus, summaries in a form suitable for offset printing will be provided the States for their publications and also for the National publication.

The Inventory will provide, for counties and States as well as for USDA, one of the most important sources of resource information ever available. Many uses and byproducts will result from the Inventory data.

Other Programs

The Service continued to assist Agricultural Conservation Program participants with permanent-type practices on which cost sharing was requested. Such service was provided in about 434,000 instances, affecting 332,000 farms. Of the farms on which assistance was given in this program, about 224,000 were SCD cooperators.

The Service provided technical assistance to about 4,000 participants in the Conservation Reserve Program of the Soil Bank during the year.

The Service continued to give direct assistance to Rural Development activities in designated areas where special funds were allotted. This assistance was mainly in soil survey work and farm planning and was in addition to regular technical help given to soil conservation district cooperators.

Assistance to the Farmers Home Administration in its conservation and watershed loan programs was continued.



From Cash Crops To Livestock

By Robert A. Hardin

THE proper use of the land on our ranch is due mainly to cost accounting," says Roy Kayler, who in eight years changed the irrigated, 900-acre Short Ranch from sagebrush to a highly productive cattle ranch.

It is well worth while to drive past the Short Ranch, northeast of Moses Lake, Wash. One can see at a glance the tremendous productive capability of the ranch.

Last year the alfalfa crop, piled in 12 large stacks next to the corrals, totaled more than 1,700 tons. In 1959, 1,500 head of 400-pound calves were fed to become 1,000- to 1,100-pound choice beefs. In addition, around 1,650 tons of sugar beets were raised on the farm. Presently, there are more than 1,000 head of cattle in the corrals and on the fields. Kayler feels the ranch has the capacity for an additional 1,000 head of cattle per year.

Many conservation practices can be observed in driving through the Short Ranch. Proper land use and



Roy Kayler (left) with his father-in-law, Howard Short, stand in front of a part of the 1,700 tons of hay produced on the ranch in 1959.

rotation are evidenced by the rolling pastures and hay fields. More than 7,000 feet of the head ditches are concrete lined. The rest of the head ditches and all of the waste ditches are seeded to redtop. There are two irrigation reservoirs, and seven weed screens.

The conservation practices on the Short Ranch were arrived at

mainly by a keen mind and a sharp pencil. Kayler, once a business student at the University of Idaho, has figures to prove the value of each of his conservation practices. They all have paid very well.

Kayler feels the most significant of all the conservation measures he has employed is proper land use. How he arrived at the decision to

Note:—The author is soil scientist, Soil Conservation Service, Moses Lake, Wash.



Part of the feeding pens and hay stacks on the Short Ranch.

so manage the farm is an interesting story.

In 1954, a cost accounting system was developed for the entire ranch, which was then a cash crop operation with potatoes, sugar beets, beans, wheat, and oats as the principal crops. Time cards for labor and other expenses were carefully recorded for each field. At the end of the season, when the books were balanced, Kayler and the other owners of the ranch decided the operation was not paying as it should. To quote Kayler, "It appeared the equipment investment and maintenance per acre was greater than could be justified by the return."

That winter, Kayler visited the Moses Lake Soil Conservation District office. There he and Pershing Vance, SCS technician, studied the soil maps, and noted that much of the land on the farm was in capability classes II, III, and IV. The decision was made to swing the farm from a cash crop operation toward a livestock program. By 1959, the operation included 200 acres of irrigated pasture, 400 acres of hayland, 75 acres of sugar beets, and 150 acres of range. Cattle were chosen because of their ability to consume roughage, which the farm could produce plentifully. Kayler feels his present operation is far superior to the previous one. It is more lucrative and he is properly maintaining his land.

The present program allows Kayler to make efficient use of his labor and equipment. Two permanent hands plus seasonal labor are employed on the ranch. All of the farm work is accomplished with four tractors.

Kayler was chosen Grant County Cattleman and Washington State Cattle Feeder for 1959. In 1957 and 1959 he was nominee for the Conservation Farmer of the Year of the Moses Lake Soil Conservation District.

During daylight hours Kayler usually is found on the ranch. He

is equally at home on a horse, a tractor, or behind a desk. In addition to meeting the demands of the ranch, he has found time to serve as treasurer of the Columbia Basin Feeders Association, as director of the Moses Lake Mosquito Control District, and as a member of the Moses Lake Chamber of Commerce Agricultural Committee.

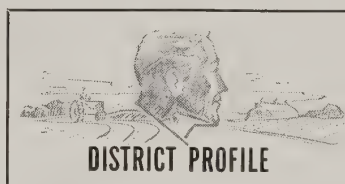
Associated with Kayler in the ranch are his father-in-law, Howard Short, who lives on the ranch; and Robert Peterson, Clyde Marsh, and Mrs. C. O. Armstrong, all of Moscow.

Kayler feels the Columbia Basin is a nearly ideal feeding area. It has a low rainfall (8-inch average precipitation); is close to calf-producing areas; is close to fat cattle markets; and there is an ample sup-

ply of good feed.

The development of the Short Ranch, which originally was sagebrush and cheatgrass, started in 1952. Kayler and his helpers had to ford Crab Creek and travel a rough trail to reach the ranch at that time. They arrived ahead of the irrigation water, electricity, and telephones. The original party lived in tents and hauled water until a bunkhouse was built and a well drilled.

Kayler recalls that a sign was found on a nearby abandoned homestead that read: "One mile to water, 7 miles to town, 6 inches to Hell. You can have it." One wonders what the homesteader would say if he saw the Short Ranch today.



Carl E. Hicks of Texas

ON May 7, 1960, Carl E. Hicks received the *Fort Worth Press* Award for being the Outstanding Conservation Farmer in Texas in 1959. He is proud of that honor.

His 249-acre farm is 40 miles

north of Houston on the Houston-Dallas Highway. On July 14 he erected a sign to announce to a motoring America that he was the State's Conservation Winner. He wanted to say "thanks" to the



Carl E. Hicks stands beside the welcome sign to his farm.

Fort Worth Press, but most of all he wanted to invite farmers and ranchers or anyone interested in conservation to come in and share the benefits of his achievement.

During the last 5 years Hicks has shared with hundreds of people the conservation knowledge and ideas that he has acquired over a period of years.

He has not always been a conservation farmer. Before he became a cooperator of the San Jacinto Soil Conservation District in 1945 much of his land was in clean-tilled, soil-depleting row crops. It took 15 years of conservation farming to get his place looking as it does today—15 years of hard work and planned attack against soil erosion, low fertility, and a well entrenched system of soil exploitation that had been followed for half a century.

When Hicks became a conservation farmer, he went into the cattle business. He now has some of the best Angus cattle in the Gulf Coast area. He constantly strives to improve them through selective breeding.

Hicks not only has changed from a system of exploitation to one of conservation, but he also has influenced other cooperators to make that change. He discovered for himself that sound land management and conservation of his soil, plant, and water resources are a very necessary part of the continuous, economical production of high-quality forage.

But conservation is more than that to Hicks. It is a conviction—a conviction that if this Nation's farmers are to stay in business, then the "conservation way" is the only way.

—CLEO DARK

No matter how you look at it, stubble burning costs you money. The organic matter not only helps maintain soil fertility but also helps the soil absorb more moisture.

Farm Donated to SCD

By Mitchell G. Hassler

HARLEY L. Hancock, 76-year-old retired Indiana farmer, wanted his farm properly cared for after he was gone—so he gave it to the Owen County Soil Conservation District.

Mr. Hancock now lives quietly in the State Soldiers' Home at Lafayette, satisfied that his beloved land is not only getting the care it deserves but that it is also serving many useful purposes for the district.

Hancock bought the 45-acre farm in 1919 with his soldier's bonus from World War I. Twenty-five acres was in woods. For 40 years he managed these woods according to the best forestry methods he could find—by reading books on

woodland management by the late Gifford Pinchot, from knowledge gained through experience, and from what he saw of forestry work overseas while in the armed forces.

The district board already has plans for making the farm a community asset. Demonstrations and tours in woodland management, improvement cutting, pine tree plantings, and tree identification will be held for 4-H members, Boy Scouts, and other groups. Wildlife area improvement and logging demonstrations are foreseen for the future on this farm.

The district supervisors see many recreational and aesthetic values on this land, considering the huge flowing spring, potential camping sites, and wide variety of trees.

A minimum tillage (plow-plant)

Note:—The author is work unit conservationist, Soil Conservation Service, Paoli, Ind.



Harley L. Hancock presenting the deed to his farm to Thomas Macy (left) chairman of the SCD board of supervisors, while other supervisors look on.

OFFICIAL BUSINESS

If your address changes, please notify us of your complete new address, including zone or RFD number, and include old address with our code number as shown above.

demonstration is planned for the 20 acres of cropland next year. It is now seeded to clover for a deserved rest.

All profits from both woodland and cropland will be used to further the district program and to encourage more and better participation in 4-H forestry, soil conservation, and wildlife projects.

In 1936 Mr. Hancock completed and recorded an inventory of his woodland (by species, total number of stems, largest tree of each kind, and total board-foot content). He did this in each of four tracts of timber. Again in 1950 he tallied the timber in the same manner and recorded the date. Records for both inventories plus the harvested total for the 40-year period were given with the farm to the soil conservation district.

Another inventory is now being made. Forty years of good woodland management data from these three complete inventories with records of all harvested material should yield sound timber growth data of great value to the district and its cooperators.



Productivity of the U.S. farm worker is growing more than twice as fast as that of industry. Since 1950, output per man-hour in non-agricultural industry has risen 2 percent a year, compared to 5 percent in agriculture.

Soil Temperature Tests On Cotton Planting Time

West Texas cotton farmers have their first reliable planting guide as a result of recent soil temperature studies at Lubbock, Tex. Cotton seedlings emerge earlier and grow faster and more vigorously if planting is delayed until minimum temperatures 8 inches below the soil surface average between 60° and 70°F. for 10 days.

Plants appeared in 5 to 9 days instead of the 2 weeks required when temperatures were below 60°. In addition, the chances of obtaining a good stand doubled. No decline in fiber quality accompanied the accelerated growth if seeds were in the ground before May 30.

Cottonseed is planted only 1 to 2 inches below the soil surface, but the workers found the 8-inch-depth temperature more accurate in figuring the average. At a depth of 8 inches, temperatures are less erratic than they are nearer the surface, yet fluctuate enough to indicate conditions at planting level.

Cotton must be planted on the Texas High Plains as soon as the danger of frost is past because of the short growing season—the mean frost-free period at Lubbock is 205 days and cotton needs warm days in which to grow. But if seeds are in the ground too early, a poor stand will result. The ideal date for planting varies from year to year.

First World Farm Machinery Congress

The first International Congress of Agricultural Machinery will be held in Paris March 2-7, 1961. During the five half-day sessions, agricultural engineering personnel from many countries will discuss papers written on the following subjects:

1. General human and social problems, especially those concerning training, arising from the mechanization of agriculture in insufficiently equipped countries which are undergoing development.

2. Economic and financial problems arising from mechanization in these countries.

3. Technical means of reclaiming land in these countries—land clearing, irrigation, and soil preparation and conservation.

4. Methods used in these countries for cultivating special crops (cereals, rice, cotton, peanuts).

The Congress will be followed on March 8 and 9 by a visit to the French Farm Machinery Show and to factories.

Further information may be obtained from the Secretariat General du Congrès International Agricole, Paris, France.



A farm conservation plan is the only safe shortcut to a permanent agriculture.

MARCH 1961

Soil Conservation



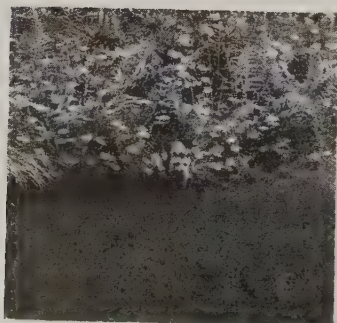
SOIL CONSERVATION SERVICE • U. S. DEPARTMENT OF AGRICULTURE



Growth Through Agricultural Progress

"The abundance of wildlife does not result from jurisdiction, sportsmen's meetings, or bureaucratic dictates; it results from what we do with the land."

—EDWARD H. GRAHAM



COVER PICTURE.—Raccoon emerging from woodland undergrowth to grass meadow.

VOL. XXVI, No. 8

MARCH 1961

CONTENTS

PAGE

- 171 Wildlife Conservation
By Donald A. Williams
- 172 Wildlife Farming in Oregon
By Henry J. Pavelek
- 174 Not Worth the Taxes
By Allen G. Mayville
- 175 Strip Mine Becomes Wildlife Haven
By Ernest Dierks
- 177 1,500 Cattle and 100,000 Deer
By Ellis F. Sedgley and Harold M. Boeker
- 179 Trout Pond in Virginia
By Wayne M. Hypes
- 180 Fish Are Soil Survey "Customers"
By Bernhard A. Roth
- 182 Beaver Pond Grows Duck Food
By Luther E. Gowder
- 183 Hunting on the Contour
By John Nehoda
- 184 Range and Wildlife Management
By Robert O. Koerner
- 186 New Home for Ducks
By Wayne A. Ruona
- 187 Pheasants—By the Hundreds
By Howard V. Cheney
- 188 More Quail and Deer
By Joe Coughran
- 189 Catfish Farming
By Brice M. Latham
- 190 Cottontails and Bobwhites
By Dalton Rushing and R. D. Fisher
- 191 Book Reviews

Soil Conservation

ORVILLE L. FREEMAN
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

TOM DALE, Editor

15 CENTS PER COPY

\$1.50 PER YEAR

FOREIGN—\$2.25 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Wildlife Conservation

In the Soil and Water Conservation Program

By Donald A. Williams

Wildlife, as we know it in the United States, is largely an agricultural crop. Like other agricultural crops, its welfare and production rest mainly in the hands of farmers and ranchers. More than half our land area is in farms and ranches and is used primarily for the production of food, fiber, and wood products. But these lands also produce most of the wildlife that we hunt, watch, or otherwise enjoy.

Rabbits, quail, doves, and pheasants make the bulk of the hunter's bag and are commonly referred to as "farm game" because they are found and hunted on farmlands. Squirrels, grouse, and turkeys are farm game too, as are great numbers of deer and antelope. Many wild ducks nest on the farm wetlands of our northern States and winter on the grainfields, pastures, and marshes of farms in the South. Other birds and mammals, including songbirds and furbearers, occur in their greatest numbers on farms and ranches. Farm ponds and reservoirs are favored and productive fishing spots.

Our present abundance of agricultural wildlife is due in a large part to our soil and water conservation program. Up until a quarter-century ago, clean cultivation, careless burning, overgrazing, and other exploitive methods of farming and ranching were not only causing great damage to our soil resources, but also were depriving wildlife of habitat essential to its existence. In many parts of the country, hunting and fishing were becoming progressively poorer.

But in the 1930's, the development of conservation farming brought revolutionary changes in agricultural practices and halted the decline of farm wildlife.

Conservation farming and ranching benefit wildlife in many ways. Contour farming, stripcropping, and terracing bring a variety of cover conditions; crop rotations, stubble mulching, and mechanized harvesting provide food; grassed waterways, living fences, and protected streambanks furnish travel lanes; and ponds and reservoirs provide new bodies of water for fish, waterfowl, and other wildlife.

Some of these conservation practices are evident to everyone—stripcropping, contour farming, and farm ponds have become standard features of our rural landscape. But wildlife is benefited by measures that are less apparent. One of these is the operation of the land capability system of classifying soils as to their suitability for agricultural use. In adjusting their land use to the capabilities of their soils, farmers retain in an undisturbed, natural condition many parcels of wildlife land that might otherwise be destroyed by attempts at cultivation. Prime examples of such areas are wetlands of high value to wildlife but with soils not suitable for cultivation. Before the use of the land capability system, thousands of acres of such wetlands were drained for cropland. They were soon found unprofitable for cultivated crops and were abandoned; but their wildlife values had been destroyed. Conservation farming retains this kind of wetland for use by ducks, muskrats,

and other wildlife.

The Soil Conservation Service recognizes that fish and wildlife are agricultural crops and considers the planned production of fish and wildlife to be a kind of land use normal to farms and ranches. While conservation farming in itself benefits wildlife in most fields, many land users wish to take specific measures to increase wildlife production. Since its establishment the Service, in providing facts to farmers and ranchers to help them make decisions as to how they will use and treat their lands, has provided specialized technical assistance in the conservation, development, and utilization of land and water areas for the production of fish or wildlife as either a principal or secondary crop.

In fact, the stated policies and objectives of the Soil Conservation Service, in respect to fish and wildlife, are:

1. To acquaint land users with the value and importance of fish, game, and other wildlife.
2. To make croplands, grazing lands, woodlands, and farm and ranch waters produce secondary crops of fish and wildlife consistent with other uses of such lands and waters.
3. To obtain crops of fish and wildlife on land and water areas used specifically for such purposes.
4. To safeguard the habitat of valued wildlife and to offset or reduce damage to such habitat resulting from changes in land use or installation of soil and water conservation measures.

Wildlife Farming in Oregon

By Henry J. Pavelek

WILDLIFE farming" may be a new term to many sportsmen and wildlife enthusiasts, but not so in western Oregon. It is going "great guns" there and its results are well known throughout the area.

Mr. Gerald Falk, of Harrisburg, is a good example. He brought waterfowl and pheasants to his farm by creating a favorable habitat for these forms of wildlife through "wildlife farming."

Note:—The author is area conservationist, Soil Conservation Service, Albany, Oreg.

To accomplish this he diverted 60 acres of his 169-acre farm from the production of surplus farm crops to the production of crops specifically for wildlife. Fourteen of the 60 acres were used in developing 7 shallow waterfowl ponds. The entire area surrounding the ponds is planted to alternate strips of corn, sudangrass, grain, and buckwheat in the spring.

Six of the ponds are planted during the spring to sudangrass or buckwheat. These ponds are flooded in the fall as desired, during water-

fowl migration. The other pond was made a permanent water area by using drainage water in the winter and irrigation water in the summer. Water plants such as smartweeds, bullrushes, spike-rushes, and wild millets were either planted or allowed to increase naturally in this permanent pond. It serves as a nesting area for a few mallards and blue-winged teal. Needless to say, the hunting on Falk's farm is superb.

On Mr. Bethel Vernon's farm in the Linn-Lane Soil Conservation District, there was an 8-acre natural wildlife area which included some seasonal ponded water and wildlife food plants. Prior to development, the waterfowl count was nearly zero. The ring-necked pheasant population of the area was estimated in 1957 to be one bird per 200 acres. In 1958, the year following development, the waterfowl count was over 25,000. The pheasant population rose to 70 birds per 200 acres. The California Valley quail increased from 3 coveys to 10 coveys.

Mr. Vernon's developments were similar to those of Falk, except that the plantings surrounding the pond were planted in blocks rather than strips. For the past 3 years 200 acres of his 335-acre farm has been farmed for wildlife. He and his friends have enjoyed some fabulous hunting as a direct result of these developments.

We all can well remember the tremendous boost in yields that has taken place with agricultural crops in recent years. Not too long ago in western Oregon, for example, it was not uncommon for dairy

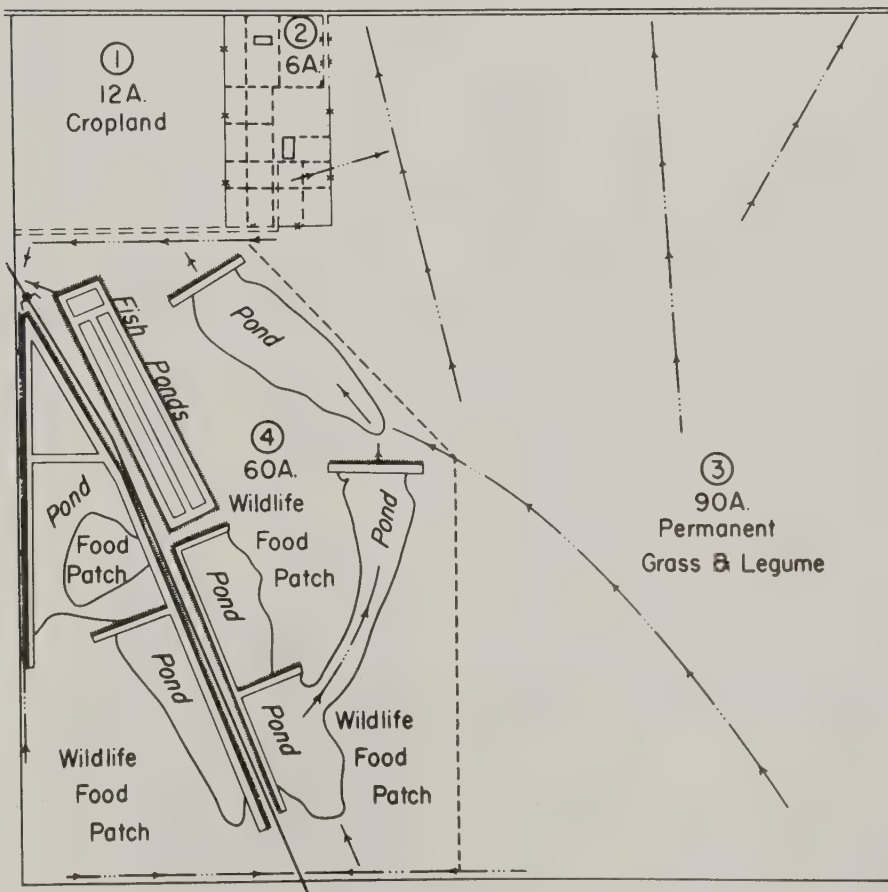


Diagram of the wildlife developments on the Gerald Falk farm.

farmers to stock their pastures at the rate of one cow to 2 or 3 acres. Under modern conservation farming methods with irrigation, however, these same pastures now produce sufficient forage to graze three cows per acre during the grazing season.

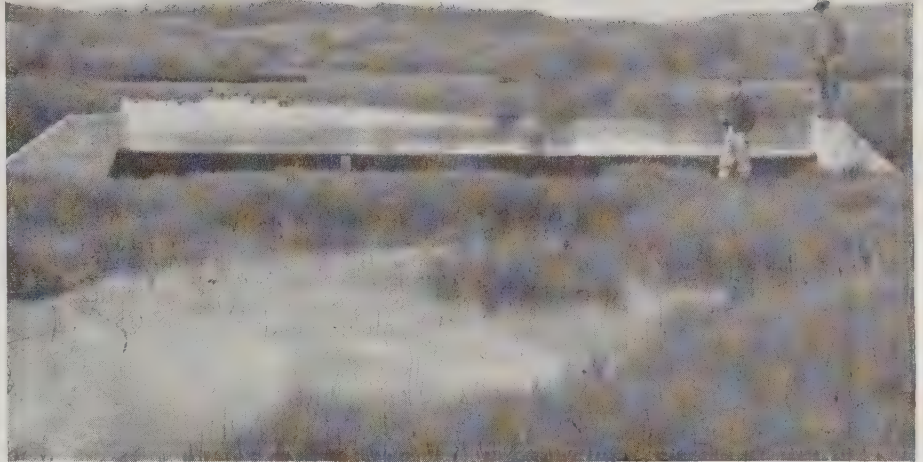
And so it is with the production of game birds, waterfowl, and other wildlife on land which is "farmed" for this purpose. The results from many of the "wildlife farming" developments are spectacular.

Waterfowl developments in western Oregon SCD's generally are of two types. One type of development consists of a permanent water area with natural food and cover. The permanent water areas are principally designed as nesting areas for mallards and other ducks which breed locally.

The other type of installation is a controlled water area designed principally to attract and hold migrating waterfowl by food plantings. The secret to this installation is food and water control. The ponds can be drained in the spring to plant them and the adjacent area to high-producing food plants. As the crop matures in the fall, it is flooded to attract waterfowl.

Grain in the form of wheat or barley is planted as an early-season food crop. Sudangrass and buckwheat, which do not mold or spoil as rapidly as grain, are used for a midseason food. Corn, with the husk protecting the kernels from the elements, is planted as a late-season crop. Usually grain, sudangrass or buckwheat, and corn are planted in alternate strips. The strips of lower-growing solid-stand crops provide semi-open water landing areas for the waterfowl.

Another typical example of wildlife farming is that of the 517-acre Lee Brothers farm in the Benton Soil Conservation District. In 1959 a concrete flashboard dam and earth dike were constructed to



Water control structure on the Lee Brothers farm.

form a 5-acre shallow pond area. A 34-acre wildlife food planting of corn and sudangrass was made around the pond.

This is in a locality where there were no ducks in the immediate area during the past 8 years. Toward the end of the 1959 season over 1,000 ducks began using this area. The pheasant population has doubled and there has been a small increase in quail. Pigeons and doves have also increased as a result of a small spring development. It required only one year to achieve these spectacular results. The excellent hunting enjoyed by

the Lee brothers and their friends has been an ample reward for their endeavors.

Many other similar examples of productive wildlife farming exist in western Oregon. Some of the farmers have taken advantage of the Soil Bank Program to assist them in making these developments; others have done it on their own.

Gerald Falk, the Lee Brothers, Bethel Vernon, and other wildlife farmers have found that management of their shooting is as important as management of their land for wildlife. As true sportsmen, these men observe strict hunting rules based on sound conservation principles. They take some and leave some for seed. As a general rule, the farmers and their city friends hunt the areas not more than two or three times a week. They have found that such light hunting pressure does not drive the game from the local area.



Hunters on the shore of a waterfowl development on the Bethel Vernon farm.

The Fish and Wildlife Service is using funds from the sale of the 1960-61 migratory bird hunting stamp to acquire and preserve waterfowl wetlands, including pot-hole areas in the northern United States.

NOT WORTH THE TAXES

By Allen G. Mayville

LAND like that isn't worth the taxes paid on it." That's the way most people felt about several hundred acres of land near the mouth of Otter Creek in Addison County, Vermont. Their attitude is easy to understand.

The land was only a few inches above the creek level at low water stage. During the spring, it was flooded five or six feet deep by runoff from the 700,000-acre watershed of the creek. Lake Champlain, just a few miles downstream, rose and held the water on it for six weeks or more. By summer, the water receded and disappeared from the surface. All that grew on the land were cattails and buttonbush.

Soil scientists of the Soil Conservation Service mapped it as fresh water marsh. No it wasn't of much use to a dairy farmer—just one more thing he had to pay taxes on.

Note:—The author is work unit conservationist, Soil Conservation Service, Middlebury, Vt.



Aerial view of the Danyow marsh area, with Otter Creek at the left.

Most farmers have no use for marsh and swampland. They can pasture the land around the edges, but cattle are likely to get mired if they venture out into it.

But to Orville Danyow, who owned 150 acres of it adjoining his 375-acre dairy farm, it seemed to have possibilities.

Orville liked to hunt, trap, and fish; and his three boys, ranging in age from 12 to 18, shared this pleasure. They shared the work on the farm, too.

The problem was that when duck-hunting season was on, the swamp was dry; there were no ducks. Muskrats couldn't use the marsh much, either, because it was not flooded long enough for them to build dens and get around for food.

Orville pondered the problem and then bought another 100 acres. This gave him control of 250 acres of marsh, bordered on one side by the higher land of his farm and on the other by Otter Creek.

Otter Creek, between Lake Champlain and the falls at Vergennes, eight miles upstream, is used today mainly by fishermen and pleasure boats; but before the days of power boats and railroads, it was an important part of the transportation system in Vermont.

Sailboats and barges regularly plied the Lake between Burlington,



Orville Danyow and son checking traps in part of their 250-acre marsh.

Vt., and Whitehall, N.Y., and through canals to the Hudson River and New York City to the south and to the Richelieu and St. Lawrence Rivers in Canada. The Otter was an important link in this transportation system. (Back in 1814, a fleet of gunboats was built at Vergennes and sailed out through Otter Creek to defeat a British flotilla on Lake Champlain.) During this time, a tow-path for hauling barges was built up on the bank of the creek. Only two or three feet above low water level, it provided a path for horses and oxen to use.

When Orville bought the 100 acres to add to his marshland, he gained control of the narrow outlet which connected the marsh to Otter Creek through the towpath on the bank. Then he called on his soil conservation district for help in solving his problem.

Soil conservationists from the Middlebury work unit of the Soil Conservation Service made a survey of the area. They designed a small earth-fill dam for the outlet of the marsh and a low concrete-and-pipe structure to control the water level and provide for draining when necessary. The dam and control structure were built late in 1958, at a cost of about \$250. The level of water stored over the 250-acre marsh was raised by nearly two feet.

Ducks and muskrats looked the place over, visited it, and decided it was good. They moved in and started to raise families.

In 1960, as more open water showed in the cattails and button-bush and word of the new housing development spread among the wood and Black ducks, gallinules, rails, and muskrats, populations increased. Orville and his sons did some muskrat trapping in the spring, harvesting about 300 pelts.

Following nesting season, hundreds of ducks could be seen using the marsh. Many more visited it on their annual migration south.

Using native materials and the boats built for trapping operations, the Danyows constructed several duck blinds and prepared for some real sport.

Their comment at the end of the

hunting season, with typical Yankee reserve and gift for understatement was, "Well, it was pretty good, for a dollar-an-acre investment on land not worth the taxes."

Strip Mine Becomes Wildlife Haven

By Ernest Dierks

TWELVE years ago the Garrison Sportsmen Club set out to see whether trees would change the rough, unsightly spoil banks of a North Dakota strip mine into a place of beauty and a haven for wild creatures.

It is evident that their efforts have been well repaid. The trees—most of them—are thriving. Pheasant, partridge, and sharp-tailed grouse are making the area their home. Occasionally you can spot a whitetail deer there, too.

The mine is the still-active Custer

Strip Mine, a source of lignite, near Garrison in the West McLean County Soil Conservation District.

In carrying out their program, the sportsmen's group had the help of the soil conservation district, the North Dakota Game and Fish Department, the Soil Conservation Service, and—perhaps more important—a group of boys from the community.

Some of the trees were planted in 1949. The soil conservation district supplied this stock, most of it left-over seedlings from the district's regular tree planting program.

The Game and Fish Department

Note:—The author is work unit conservationist, Soil Conservation Service, Washburn, N. Dak.



Trees and shrubs in the Custer Strip Mine area that were planted by the Garrison Sportsmen Club.

Stubble Mulch Farming

Stubble mulch farming is an effective practice in controlling wind erosion. It also is effective in controlling water erosion by reducing runoff and increasing the storage of moisture in the soil during intense rainstorms. But stubble mulching is not a substitute for other good conservation practices. Contour farming and terracing improve the effectiveness of this practice on hardlands by increasing the storage of water in the soil.

Stubble mulch farming is not only a method of tillage but also a planned system of farming. The mulch provides protection against wind erosion on sandy land, second only to grass or growing crops. It also is effective on hardlands that are subject to wind erosion.

Stubble mulch operations should start at harvest time. A good straw spreader is needed to insure an even distribution of straw so that piles or windrows of straw are avoided. The height of the cutter-bar should be regulated to provide maximum height of stubble without hampering harvesting of the crop.

Tillage operations should be timely and should maintain an adequate amount of mulch on the surface throughout the season, control weeds, provide a cloddy field surface for erosion control and water conservation, and provide a moist, firm seedbed at seeding time.

Seeding operations should be done efficiently to provide a good crop yield and an adequate amount of residue for the next season, and at the same time maintain enough residue on the surface to protect the field surface and the young plants from wind erosion.

WALTER E. SELBY
*Agricultural Engineer
Kansas State Extension Service*

◆

In each 5-year period since 1935 the average farm size has increased by 10 to 13 percent.



Pond in the Custer Strip Mine area with willow plantings around the edges.

then began furnishing seedlings also.

The men of the Soil Conservation Service helped with their tree planting know-how.

A spoil bank is no place for tree-planting machinery such as is used to plant windbreaks on North Dakota farms and ranches. The job had to be done entirely by hand.

A man and a boy made a tree-planting team. The man opened the hole, the boy placed the seedling and tamped the soil around it.

The teams planted thousands of trees each year through 1959.

Several of the first plantings have made splendid progress. Chinese elm in some areas are over 20 feet high. Willow cuttings, put on the edges of some of the permanent water holes, have made good growth. Russian olive are doing well.

Ponderosa pine and cedar are making progress, too. However, survival of these species, as might be expected, has been less and growth is naturally slower.

No cultivation is possible on spoil banks. The trees have to make it on their own. Of course, there is

little competition from grass and weeds on the spoil banks, which helps. And the spoil area is protected from grazing.

Some of the sharp ridges of the banks were leveled with bulldozers and basins shaped on top to catch rain and snow. Trees were placed around the edges of these depressions to get the benefit of the additional moisture.

In undisturbed areas adjacent to the spoil banks, the Game and Fish Department planted trees with regular tree-planting equipment. These trees have been cultivated regularly.

The Garrison Sportsmen Club takes great pride in the results of its effort.

"We think we have proved something that can be useful over the rest of the lignite mining area in the State," said Walter Link, club president. "There are hundreds of acres of these spoil banks in North Dakota. We got pleasure in carrying out the project. It gave us a chance to do a worthwhile job with our youngsters, all of whom got a lot of benefit—conservationwise—out of it, too."

A CONSERVATION PLAN FOR 1,500 Cattle and 100,000 Deer

By Ellis F. Sedgley and Harold M. Boeker

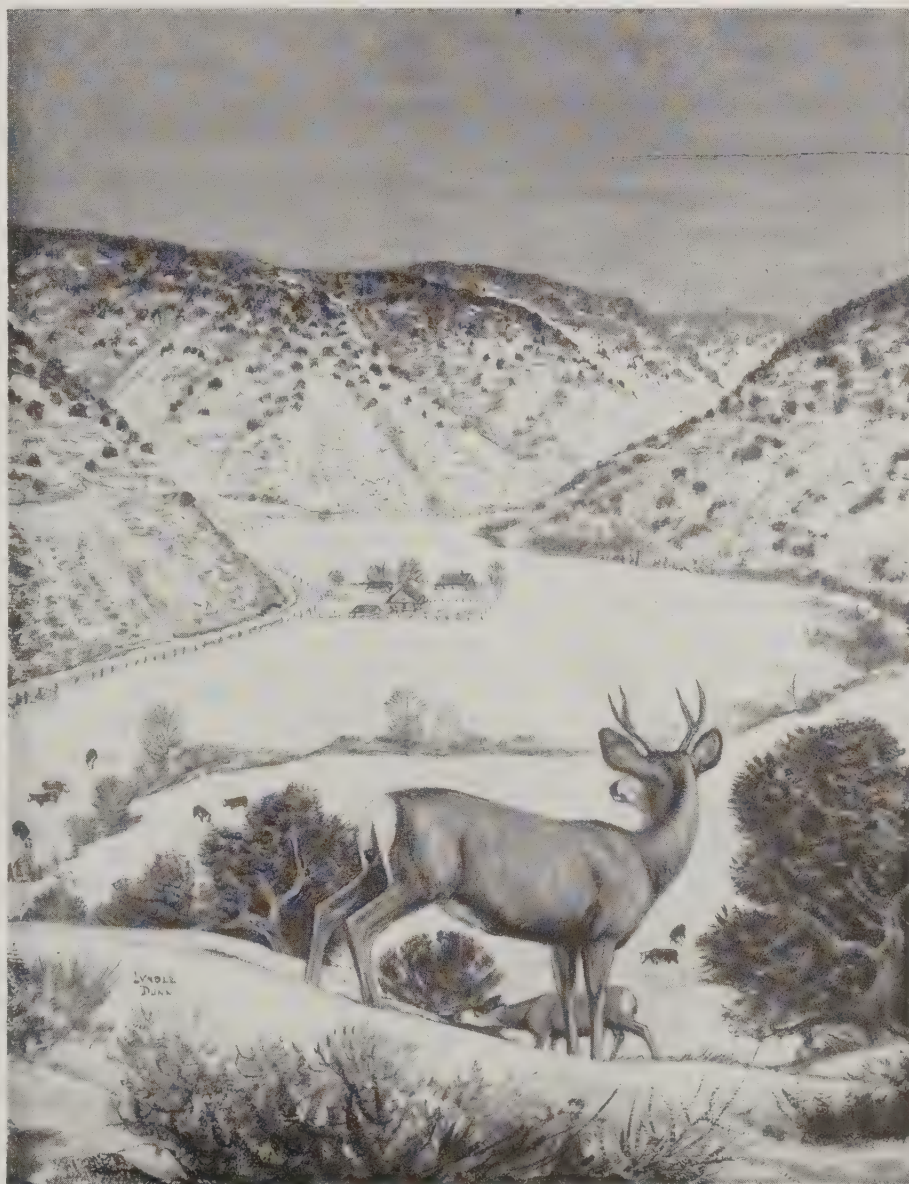
TECHNICIANS of the Colorado Game and Fish Department, the Soil Conservation Service, and the Bureau of Land Management are presently working out a unique conservation plan. When completed, the plan will include management policies and land improvements for a 218,000-acre ranch owned and operated by the Colorado Game and Fish Department. The ranch presently supports, under lease agreements, approximately 1,500 Hereford cattle and, with adjacent areas, the largest migratory deer herd in the United States—estimated at 75,000 to 100,000 animals.

The White River Plateau was the historical game range of the Ute Indians. Following the famous Meeker massacre in 1879 and the expulsion of the Utes to Utah reservations, cattlemen moved into the lush Indian lands with thousands of cattle. From 1880 to 1920 the country experienced great vegetative and biological changes. The pressure imposed on grass cover by cattle caused a shift from grass to browse-type vegetation. The increase in browse favored the deer, and there was an explosion in deer population. By 1920 the range was no longer suited for cattle. From 1920 to 1940 sheep interests joined the cattle and deer in competing for what was left. As the total vegetation decreased, soil stability was lost and erosion threatened to destroy the once-productive land. Livestock operators

were forced to cut their herds drastically. Starvation cut back the deer herd.

Realizing the importance of maintaining the White River deer

herd, the Colorado Game and Fish Department in 1946 acquired a large block of land in the heart of the White River deer herd's winter range and established the Little



Artist's conception of Little Hills ranch on the White River Plateau of Colorado.

—Artwork by Lyndle Dunn, Colorado Game and Fish Department

Note:—The authors are, respectively, work unit conservationist, Soil Conservation Service, Meeker, Colo., and regional land manager, Colorado Game and Fish Department, Rio Blanco County, Colo.

Hills Experiment Station. Studies were begun at Little Hills to determine the interrelationships between range conditions and various degrees of use by livestock and deer.

The Little Hills studies showed a marked difference in forage preferences by cattle, sheep, and deer. Cattle preferred grass, sheep preferred forbs, and deer were heavy users of browse plants. Only when one type of animal was out of balance was there serious damage to the range.

In 1956 the Colorado Game and Fish Department acquired two additional ranches adjacent to the Little Hills unit. The new acquisitions, with their public domain grazing permits, gave the department control over a major portion of the White River deer herd's spring and winter range.

Cattle numbers were reduced from 3,200 to 1,500. Liberal hunting seasons were used to reduce deer numbers—in 1957, hunters took 25,000 deer from the White River herd.

The department became a cooperator with the Lower White River Soil Conservation District in 1957. Soil Conservation Service technicians joined Game and Fish Department personnel in solving the problems of multiple use.

SCS surveys of the Little Hills unit showed an unbalanced graz-



Harold Boeker and Ross Campbell tagging a trapped deer on the Little Hills ranch.

ing pattern by livestock. With the cooperation of the Bureau of Land Management, new water developments were constructed to improve cattle distribution. The lessee, an officer of the Lower White River SCD's board of supervisors, agreed to improve and develop spring pastures on his patented land. Today, with less grazing pressure and better distribution, the ranges are improving.

Tentative plans include the control of big sagebrush on summer ranges. Here range productivity for cattle can be increased without greatly reducing palatable deer browse. Deer use very little sagebrush in their summer diet. Sagebrush on critical deer winter ranges will not be controlled.

Large acreages of fertile bottomlands were overrun with unpalatable plants such as rabbitbrush and greasewood. These areas will be converted through brush control and reseeding to wheatgrass pastures. During early spring, deer feed heavily on new green grass, and the wheatgrass will provide spring grazing and alleviate deer pressures on other areas. The wheatgrass bottomlands may also serve as cattle pastures in the multiple-use pattern.

Stock ponds and drift fences will be constructed to improve live-

stock distribution. A system of deferred grazing will be initiated to give large range areas periodic rests. Meadow improvement practices will be established to increase hay and pasture production on irrigated lands. All of these practices will be aimed at balancing range use by cattle in a manner that will improve range condition.

At the same time a parallel management program will be followed to maintain the deer herd in balance with feed conditions. Trend counts and hunters' kill reports will be used to indicate the trend in deer numbers. Hunting seasons and bag limits will be closely regulated to keep the deer herd in balance with the food available.

Through a sound multiple-use plan of conservation management, the range should return to a stable, productive condition. The great migratory deer herd of the White River will be assured for future generations of sportsmen, and once again there will be lush grass for White River cattle.

A total of 14,634 SCS employees were registered in the Government-wide health benefits program in 1960. Of these, 49 percent registered in the service benefit plan, 42 percent registered in the indemnity benefit plan, and 2 percent registered in one of 16 other available plans. About 7 percent expressed their desire not to participate in any of the available plans.



Mountain mahogany, a favorite deer food plant, and other browse plants on Little Hills ranch.



Trout Pond in Virginia

By Wayne M. Hypes

RAISING rainbow trout in Virginia farm ponds is a difficult undertaking. Biologists tell you that even when certain conditions are met, success is not certain. The conditions include maintaining a water temperature below 70 degrees F. and a rapid change of water in the pond.

C. R. Osborn, owner of the Mill Run Farm in Bath County, wanted a trout pond. He requested SCS technicians assisting the Mountain SCD to lay out and supervise the construction of a pond for trout. Search for a site revealed about 4 acres of idle wetland which it was not practicable to drain. The spot was an eyesore that did not fit into the landscape of the farm.

This proposed pond site had a 640-acre watershed. The large size of the watershed caused some problems in the discharge of flood-

waters safely and keeping silt and trash out of the pond. One encouraging factor, however, was a cold spring in the watershed with some native trout in the spring branch. A later survey showed that the spring had a low flow of 2,000 gallons per minute with a temperature of 58 degrees.

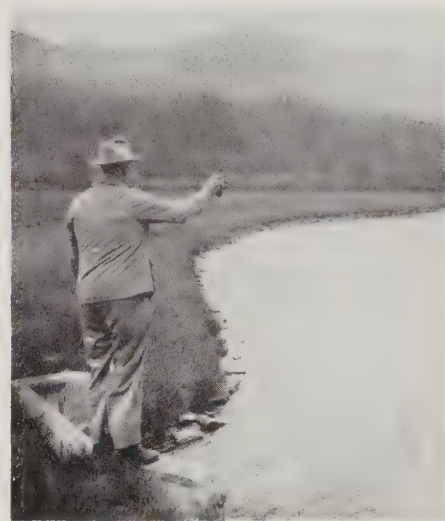
The design agreed on called for a concrete spillway above the pond to control floodwater. The spillway created a catch basin to keep silt and trash out of the pond. A 24-inch pipe, with gate valve, carries water from the catch basin into the pond. Another 24-inch pipe through the pond dam serves as an overflow pipe.

In 1955 the four-acre pond was completed. Osborn stocked it with 1,000 rainbow trout fingerlings furnished by the U.S. Fish Hatchery through the Mountain Soil Conservation District. He purchased an additional 1,000 mature rainbow trout in 1956.

Note:—The author is soil conservationist, Soil Conservation Service, Staunton, Va.



Concrete-lined spillway and catch basin above the Osborn trout pond with gate valve to regulate water flow into the pond.



Cy Osborn casting for a rainbow trout near the intake to the trout pond on Mill Run Farm.

Ever since, fishing has been excellent and the rate of growth good. The highest temperature recorded has been 68° F. in top water and 64° in deep water. Water depth ranges from 3 feet to 12 feet.

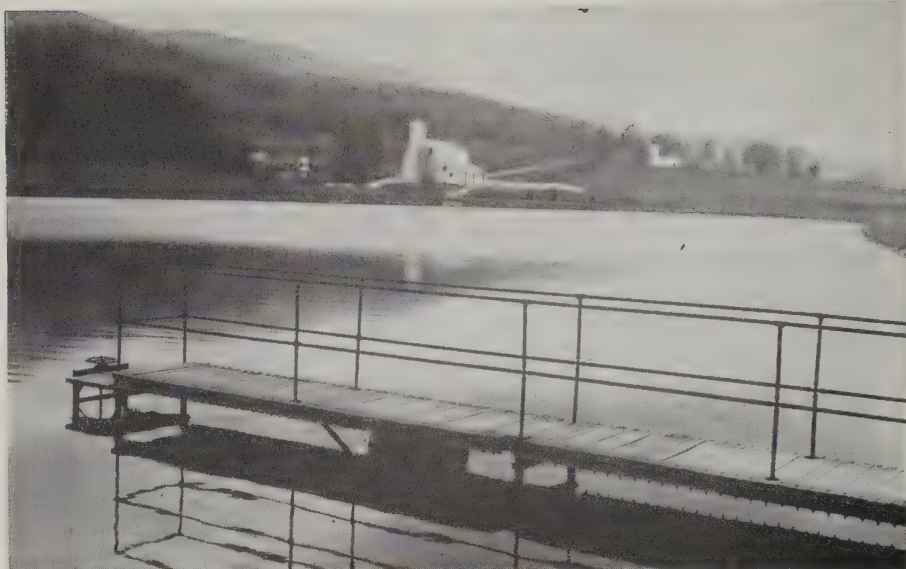
An interesting feature of this pond is that the trout go upstream to spawn. During spawning season large trout can be seen going through the 24-inch intake pipe and up the stream. There is about a 1,000-foot stretch of stream between the pond and the spring. Red trout eggs can be seen all along the gravel beds in the stream. The presence of fingerlings proves that the trout do spawn successfully. Small as well as large trout have been caught in the pond—further proof of spawning. All indications are that satisfactory fishing can be maintained without further stocking.

Fishing in this pond is not like fishing in a barrel as a lot of people think. The fish have become acclimated to the water, and you have to be an experienced fly fisherman with a reasonable

amount of luck to land a nice creel. When you do, you may have a trout that is 18-20 inches long. Fishing is permitted by invitation only.

It is apparent from Osborn's experience that in the higher elevations of Virginia, and where there is a good supply of cold water, trout can be produced successfully in properly designed farm ponds.

Before building the pond, Osborn and his farm manager, Wayne B. Schooler, had been applying a coordinated soil and water conservation plan with technical aid from SCS technicians. They had successfully installed 7,000 feet of tile drainage and 4,000 feet of open ditches. They had seeded several acres of pasture, improved all the other pasture, and established 10 acres of alfalfa and orchardgrass. With the assist-



Pier constructed over the overflow pipe and gate valve on drain pipe of the trout pond, with the Osborn farmstead in the background.

ance of the Virginia Division of Forestry, all woodland management and conservation measures

were in effect. In general, Osborn and Schooler were practicing good conservation on all their land.

'Way Down East—

Fish Are Soil Survey "Customers"

By Bernhard A. Roth

THE soil needs of Mama Salmon and Mama Clam may seem of trifling concern—and for eccentrics only—when viewed in the shadow of vaster sciences of the earth. But not in Washington County, Maine! For the citizens of "U.S.A.'s sunrise county" reckon that these two species of waterlife are among the most important assets of the county.

So, when SCS soil scientists started to survey and map the soils of Washington County, State fish and game officials soon asked for help on some of their problems. "Like it or not," observed Keith

A. Havey of the State Department of Inland Fish and Game, "salmon are customers for your soils information. We find there's a marked relationship between type of streambottom and location of spawning and nursery areas."

SCS soil surveyor Kenneth J. LaFlamme agreed that fish, along with all other local natural resources, seemed legitimate beneficiaries of their services. From Havey, LaFlamme learned that the propagation of salmon rests vitally on a key number of streams featuring cobbly-bottomed riffles. Here, the female salmon "digs" egg pits known as redds and the male fertilizes them in the fall, for



Keith A. Havey (left) and Kenneth LaFlamme studying a cobbly bottom on Barrows Stream.

Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.

hatching in the spring.

Salmon specialists, according to Havey, can accurately predict the rate of reproduction—and thus stream population trends—only when they know the precise acreage and location of suitable bottoms. Stability and control for a soils study were reasonably assured in that salmon are “homers” with a powerful instinct to use the same grounds year after year.

LaFlamme saw no reason why strips of streambottom—often no more than 20 feet wide—could not be comfortably added to his routine investigations in the back country. As a trial, he and Havey have been type-mapping a half-mile of Barrows Stream on the upper reaches of the East Machias River. The stream is an inlet to Love Lake, topnotch landlocked salmon center in the East Machias watershed. Landlocks use the stream for spawning each year.

Salmon soil-mapping currently includes delineating bottoms directly related to the fish—sand, gravel, and cobbles at the head or tail of rapids. For his own efficiency in a mission foreign to most SCS soil scientists, LaFlamme is developing new techniques in scanning streambottoms largely by studying related soils at the bank-side. It saves considerable wading and frequent dousing in waters seldom far from freezing, even in summer.

The soil scientists got into the clam industry in similar fashion. Malcolm E. Richards of the State's Department of Sea and Shore Fisheries reported that local clammers were suffering from shrinking production on nearby flats. Seriousness of the situation stimulated his interest in leaving no stone unturned to improve matters. He knew there were many things yet to be learned about the relationships of soft-shell clams, other marine organisms, and marine sediments. He figured that

a proper interpretation of soil survey information should help solve some of the problems.

SCS soil scientists gathered some surprising facts from Richards. Contrary to popular belief, clams do not simply stick in the mud. As young juveniles, they select a variety of sediment in which to wrap their byssus threads and develop. They are believed to move around a great deal to find suitable conditions. Reasons behind their affinity for certain sediments are a mystery.

Since tidal areas are available to them even in the depths of Washington County's most severe winters, SCS men have welcomed the chance to be helpful to the local marine fishing enterprise, worth close to \$3 million yearly. Sediment investigations are now underway on Passamaquoddy Channel Flats below Lubec, prime clamming grounds since prehistoric times.

Classification of soils and sediment for the advantage of fish and wildlife biologists is not new. But



Malcolm E. Richards (left) and Kenneth LaFlamme investigating sediment types on Passamaquoddy Channel Flats.

it is big news in the U.S.A.'s easternmost county where the protection and management of nature's wealth clearly affects the fortunes of everyone. Happier clams and more satisfied salmon will continue to be worthy of soil surveyors' efforts in Washington County folks' scheme of things.



SCS soil scientist and Maine fish and game biologist making a seine-count of the salmon hatch on Barrows Stream.

Beaver Pond Grows Duck Food

By Luther E. Gowder

GRAYFIELD Hamilton, a Greene County, Ala., farmer, leased the duck hunting rights over a large beaver pond area to sportsmen last fall. The lease is for a period of 12 years and brings Hamilton a substantial income from an area that previously was producing nothing of value.

In the spring of 1959, Mr. Hamilton was disturbed by the damage beavers were causing to his land and timber by impounding water. One large 85-acre beaver pond was killing fine young hardwood timber, and making the whole

area worthless for any other profitable use.

Mr. Hamilton, a cooperator with the Black Belt Soil Conservation District, appealed to his local soil conservationist for help. A Soil Conservation Service biologist, Dale H. Arner, was called in to help with the problem.

Arner proposed that they break the beaver dam in June 1960, and lay a 3-log drain in the break so the water would continue to drain if the beavers repaired the dam. This drain was installed under the supervision of J. P. Tidmore, SCS soil conservation aid. The beavers attempted to repair the dam but could not stop the water from

flowing between the three logs that were tied together with wire.

After the water left the area by way of the 3-log drain, Hamilton cleared 25 acres and planted it to Japanese millet. The rest of the 85 acres, which had a scattered stand of young timber on it, produced a volunteer crop of smartweed. Both areas produced excellent seed crops, which are choice duck foods.

In October Hamilton pulled the 3-log drain out of the gap in the dam. A few days later the beavers had repaired the dam. As fall rains came, the water from springs and the small creek began to cover the millet and the smartweed plants.

Then with colder weather came the ducks. Duck shooting was very good in this area by late November. The hunters are pleased with their lease and their hunting rights. Hamilton is happy to find a profitable and pleasurable use for the 85 acres of swampland that had previously appeared useless.

The techniques for developing duck ponds from beaver ponds are simple and inexpensive. The ponded water is lowered in June or July by breaking the beaver dam. The 3-log drain is placed in the break to allow continuous drainage should the beavers repair the dam. For some unknown reason, in the past the beavers have not rebuilt the dams during the summer season.

The wetter areas should be planted to Japanese millet by broadcasting the seed over the wet, freshly drained land. The drier areas should be seeded to browntop-millet after good seedbed preparation. All seeded areas should be

Note:—The author is work unit conservationist, Soil Conservation Service, Eutaw, Ala.



Breaking a beaver dam to drain the 85-acre pond on the Grayfield Hamilton farm.



Japanese millet growing in the drained area above beaver pond on the Hamilton farm.

The water impounded kills extensive stands of hardwoods and floods small bottomland fields and pastures. The beaver's fur has some value, but its value does not equal the damage inflicted on Alabama farmlands.

The system that SCS biologist Arner has developed now enables soil conservationists to help landowners plan, establish, and main-

tain profitable land use on areas the beavers have taken over. By developing the ponds for shooting areas, a farmer can utilize this wildlife species, once considered a pest, as a partner in his conservation operations.

No doubt the development and management of beaver ponds will be improved as additional experience is gained.

Hunting on the Contour

By John Nehoda

fertilized. A natural stand of smartweed usually comes into these areas. The degree of wetness that remains on various sites should determine whether Japanese millet or browntopmillet be planted. The seed of all these plants usually matures during October in this climate. At that time the drain logs should be removed. The beavers usually will rebuild the dam within a few days.

Beavers have flooded many bottomland areas in Alabama, usually in flat, wet, woodland sites, and beavers are increasing rapidly.

THE old saying, "good news travels fast," was not coined by a hunter; but they sure make use of it when it comes to locating good hunting areas. That's the way Eddie Phillips put it as he counted the cars parked around his farm buildings on opening day of hunting season.

The first week more than 60 hunters from the greater Pittsburg area spent at least four hours apiece on Eddie's 138 acres near Greensburg. "The older fellows," Eddie remarked, "stayed all day. The hunting was good; rabbits, squirrels, and pheasants were plentiful."

Five years ago things were different, Eddie recalls. Hunters made no special effort to hunt his place. In fact, Eddie himself did very little hunting on his newly purchased farm. Today, long before the gunning starts, hunters drive out to see Eddie about getting permission to hunt. What made the difference?

Shortly after Eddie bought his rolling hill farm, he became a co-operator of the Westmoreland County Soil Conservation District. With the help of SCS technicians, he developed a conservation plan

for managing his land. His aim was to use the land to support his growing dairy herd and he wanted to hold the soil and water on the farm.

Three and a half years have gone by since Eddie set out to reach his objectives. This year he placed first in the Baltimore and Ohio Conservation Contest for his outstanding work in managing the soil, water, woodland, and wildlife on his farm. And he's producing just about all of the feed needed by his 68-cow dairy herd.

Farming is a little different now, Eddie tells you. "We are holding most of the rain that falls on our land by using contour stripcropping. Each row acts as a dam, reducing the loss of soil and water



Volunteer stand of smartweed in drained area above beaver pond on the Hamilton farm.



Eddie Phillips hunts small game in a border strip on his farm.

Note:—The author is work unit conservationist, Soil Conservation Service, Greensburg, Pa.

from the farm. I've also noticed how yields have picked up since we started stripcropping.

"There's been another change, too, since I started stripcropping, and that's the increased number of pheasants that hang around all year. Wildlife specialists tell me that ideal wildlife areas are created where different strips or edges of crops meet, such as corn and grass or small grain and grass. The edges make good nesting places for quail and pheasants. This idea of edges is new to me but I know that since I started stripcropping I have seen a lot more small game on my place.

"Last spring the Pennsylvania Game Commission helped me establish the wildlife border outlined in my farm conservation plan. We cut down a strip of woods 30 feet wide and 2,000 feet long next to the crop fields. Long whips of native shrubs and other vegetation moved in and so did the hunters. The area was a beehive of activity



Jack Nehoda, SCS technician, (left) and Eddie Phillips check a recently constructed terrace on the Phillips farm.

all during the gunning season. Men and dogs worked it hard with a lot of satisfaction."

An area 30 by 2,000 feet sounds like a lot of land to devote wholly to wildlife, but Eddie doesn't look at it that way. Eddie recalls how the crops next to the woods always looked poorer than the rest of the field. Shading and competition for

moisture by the trees made the difference. Then there was always the problem of low-hanging limbs interfering with field work. Eddie also is aware of the value that wildlife border will have in increasing the number of insect-eating birds on his place.

Ending in the wildlife border are grassed terraces which circle the entire farm—protecting the land from erosion by leading off the surplus water. These terraces are good travel lanes for reaching new areas of food supply. Ground-nesting birds find the terraces ideal, for they provide ready access to food, water, and shelter. To Eddie Phillips, these terraces provide protection for his chief resource—his soil.

Farm game has been on the increase on Eddie Phillips' farm in the past few years even with a healthy gain in the number of hunters. In reaching his goal of better land use, wildlife also benefit.

Range and Wildlife Management

On a South Dakota Ranch

By Robert O. Koerner

THE 7,000-acre ranch of Glen E. Garrett in western Sully County, S. Dak., is a fine example of how a ranch can be developed and managed to produce record crops of beef and wildlife.

Garrett credits his thriving wildlife populations to three essentials—cover, food, and water. These are provided in varied ways on the ranch as Garrett carries out a complete Great Plains Conservation Program plan. He was the first in the Sully County Soil Conservation District to enter the program and lost no time putting his plan into operation.

Proper range use—beneficial to wildlife as well as to domestic animals—has always been a rule on the Garrett ranch. The heavy grass and mulch slow down runoff. As a result, his stockwater ponds haven't been filling even in years of above-normal rain. That has meant fine cover but sometimes not enough water.

Water was always a worry on this ranch. Glen's father, Geoff, recalls, "We never knew whether we would have enough to carry the stock through the summer. If we didn't get enough runoff in the spring to fill the ponds, they would be nearly dry by fall."

The Garretts put in many stock ponds over the years; but with the meager runoff, water was not dependable enough to permit the right kind of rotation grazing system.

"The better we managed our range the less runoff we would get," Garrett stated. "This complicated things still more. The Great Plains Conservation Program seems to be the answer to this problem. We have been needing help like this for 25 years."

The Great Plains Conservation Program helped the Garretts put down two artesian wells. Now, water from these wells flows to 14

Note:—The author is work unit conservationist, Soil Conservation Service, Onida, S. Dak.

stockwater ponds through 26,000 feet of underground plastic pipe.

The Garretts say this water is as useful to wildlife as it is to livestock. Last year in Sully County most pheasants and other birds suffered from lack of water. Yet on the Garrett ranch, pheasants and grouse could be seen at almost any time coming from the surrounding trees and fields to water.

The deeper ponds are stocked with bass and bluegills. One pond is stocked with rainbow trout. That means food and fun for the family and the neighbors. Garrett manages his ponds to maintain a productive balance in numbers and kinds of fish.

Thousands of ducks and sometimes a few Canadian geese rest on these ponds during migration season. An abundance of feed in the surrounding cornfields also attracts these birds.

Garrett carefully protects the wildlife on his farm but he does not prohibit hunting if people "ask before they enter." He explains that he has a big investment in his livestock and cannot afford to have gates left open.

In the past 10 years, Garrett has



Part of the Garrett range in the foreground where controlled grazing has resulted in good grass growth for livestock and wildlife.

planted 32 acres to trees. Ten of these acres were planted strictly for wildlife. About 500 sharptail grouse and prairie chicken, along with many pheasants, have been wintering in the trees. In the warmer months, deer from the Missouri River breaks use these wooded areas. In the spring of 1960, Garrett planted 22 acres more to trees and shrubs under his Great Plains Conservation Program plan with accent on kinds beneficial to wildlife.

A 65-acre wildlife area behind

Garrett's largest pond is fenced to keep out livestock. A pipe through the dam with a tank and float below supplies water for livestock. This protected area is in top condition. It has an abundance of taller growing grasses such as big and little bluestem, sideoats grama, needle and thread, green needle, and western wheatgrass. Western snowberry, buffaloberry, wild plums, and other wildlife cover plants grow in the side draws.

Food for wildlife is provided by grass seed and the fruit and berries from the tree and shrub plantings. Garrett plants corn on some of his cropland and leaves it in the field until he turns hogs into it in the fall. The corn left by the hogs makes fine feed for migrating ducks and geese as well as for pheasants, deer, and grouse.

South Dakota wildlife has never had truer friends than the Garretts. Since 1883, three generations of Garretts have maintained and improved wildlife habitat on this ranch. Through proper land use aided by a complete conservation plan, they have increased the production of wildlife in the same manner in which they have increased livestock production. Although their range and wildlife habitat are in excellent condition, they are continually striving to improve them.



Part of the 65-acre wildlife area on the Garrett ranch that has been fenced to exclude livestock. The pond is stocked with fish.

New Home for Ducks

By Wayne A. Ruona

WILDLIFE is getting a new lease on life in the Becker County Soil Conservation District of northwestern Minnesota. A 140-acre wildlife development has been constructed which will give a boost to useful forms of wildlife, make the hunting better for miles around, and help in flood control.

It all began when a group of sportsmen from St. Paul and Minneapolis set out to find a good hunting and duck-breeding site.

"We'd like to buy an isolated piece of ground that we can fix up to suit ourselves," a spokesman for the group told Soil Conservation Service technicians at Detroit Lakes. "It would have to include some low ground and have possibilities for hunting and duck breeding."

It so happened that the SCS people knew of a swampy pasture area, site of a former lake, which had been drained by a legal drainage district about 40 years ago. It seemed to meet all the requirements.

The Twin City sportsmen organized themselves into the Hamden Gun Club. Then they bought the land around the old lake and got easements on some additional acreage to make a compact unit.

As landowners, they were eligible to enroll as cooperators with the Becker County Soil Conservation District and make an official request for the biology and engineering help they needed.

Plans, as later completed by the Hamden Club and SCS technicians,

called for development of two pools—the upper one to be a water reservoir and duck breeding area with a maximum water depth of five feet; the lower to be used for growing duck foods during most of the year and then flooded in the fall.

When full, the upper lake provides 70 acres of water surface.

About 75 acres in the lower pool is flooded to a depth of 1½ feet in the hunting season. The earth dam for the upper pool, 500 feet in length and 24 feet wide on top, is used as a farm road. The lower dam is 700 feet long with an 8-foot top width. Both dams have built-in water control structures.

To make the place more inviting



Wetland area developed for wildlife by the Hamden Gun Club: (above) The area before development. (below) A part of the 70-acre upper pool after the earthen dam was constructed.



Note:—The author is work unit conservationist, Soil Conservation Service, Detroit Lakes, Minn.

to ducks, 13 mounds of earth were pushed up with a bulldozer on the floor of the upper pond. The resulting islands provide additional nesting and loafing space to supplement the shorelines.

In the spring and summer of 1959 over 200 young ducklings were seen on the upper pool. In addition, ring-necked pheasants were present on the adjacent land.

The owners had little difficulty in getting their limits during the following hunting season.

In March 1960, 63 muskrat houses were counted and mink sign was abundant, clearly indicating that this area has benefited furbearers as well.

On May 6, 1960, over 1,000 waterfowl were counted on the upper pool. Canvasbacks, red-heads, blue-winged teal, mallards, lesser scaup, and pintails were some of the duck species identified.

If managed properly, good duck foods like browntopmillet, barley, buckwheat, and smartweed can be seeded in the early spring after draining the lower pool.

If everything goes as planned, there should be a continuously rich reward in ducks, fur-bearing animals, songbirds, and other wildlife. There also will be more water storage and less flooding of farmland from heavy summer storms.

◆

Sustained Superior Performance awards amounting to \$85,447.71 were made to 518 employees by the Soil Conservation Service during fiscal year 1960. The Service also awarded \$4,080 to employees for 61 special acts or services.

◆

The automotive fleet of the Soil Conservation Service, consisting of 841 passenger vehicles, 10,349 light trucks, and a few miscellaneous vehicles, traveled 99,305,940 miles during the fiscal year 1960. The average cost per mile was 5.67¢.

Pheasants— By the Hundreds

By Howard V. Cheney

HUNDREDS of pheasants—any time you care to look for them! This is a hope that a Kansas rancher, Judson Barclay, Jr., has brought close to reality on his 1,030-acre place near Grinnell through a well-planned program of soil and water conservation with an outdoorsman's special interest in wildlife.

Barclay is not yet through with his effort as a conservation rancher and wildlife enthusiast. His latest step has been to develop a complete soil and water conservation plan under the Great Plains Conservation Program.

This plan, which he has worked out with the help of the Soil Conservation Service men assigned to the Gove County Soil Conservation District, is not substantially different from the conservation plan he developed in cooperation with the

district a few years ago. But it has the advantage of a thorough schedule for carrying out the work, plus cost-sharing help for major practices to speed up the job.

Barclay, who serves as chairman of his soil conservation district board, began his wildlife improvement work years ago. For part of it, he made use of cost-sharing help from the Agricultural Conservation Program with technical assistance from the Soil Conservation Service.

Then when the Soil Bank program began, Barclay made use of the opportunity to include the wildlife practices offered in the Conservation Reserve part of the program. He planted part of his better cropland to native grasses. To get good distribution of food and grassy cover, he planted 1-rod-wide strips of sorghums every 100 yards in this 400-acre field. Between the food strips he put a

Note:—The author is work unit conservationist, Soil Conservation Service, Gove, Kans.



A section of the 2,000-foot-long windbreak planting on the Barclay farm, with wildlife food planting of sorghums on the left.

native grass mixture of bluestems, western wheatgrass, and sideoats and blue grama.

For winter cover Barclay added a five-row tree and shrub windbreak 2,000 feet long below a terrace. The two north and west rows are North Platte wildling redcedar, the center row is half mulberry and half Russian olive, and the two south and east rows are made up of 10 kinds of shrubs. The

foodpatch plantings are near the windbreak.

Early in 1960 Barclay set out to complete his work under the Great Plains Conservation Program. He will practice proper use of his range resources and the conservation use of his crop residues. Both of these practices are important in conservation ranching, but neither draws cost-sharing help for the rancher. Cost-shared practices in-

clude the completion of terracing, building needed dams, and planting hedgerows and odd corners to cedar.

Barclay has gone far enough with his program to feel sure he is on the right track. Pheasants have been showing a marked increase. His place soon should have few equals as a home for wildlife—especially pheasants—in this part of Kansas.

More Quail and Deer

On a Texas Ranch

By Joe Coughran

HARRY Zavisch is about half through with the brush control and range reseeding job on his southern Texas ranch. And he says: "I have more quail than ever, and just as many or more deer."

Zavisch has more than the ordin-

ary interest of a rancher in wildlife. For one thing, he and others in his family like to hunt. And, hunting leases are a source of income for Zavisch. A group of sportsmen leases the ranch for hunting privileges each year.

Zavisch started with 220 acres southeast of Tilden, Tex., in 1932.

He added to the place over the years. The ranch now covers 2,291 acres.

The range had good grass until 1947. Then a three-year stretch of declining rainfall began, followed by five years of severe drought. This left the range practically bare except for the dense brush.

At the start of the drought, Zavisch noted the rapid decline in his range grasses. There was a drop, too, in income. In January 1951, Zavisch got help from the Soil Conservation Service men assigned to the Dos Rios Soil Conservation district. With their help, he worked out a conservation plan. In this plan he gave plenty of thought to the needs of wildlife.

"I had been trying to protect my range," Zavisch said. "But the drought was always a long jump ahead of me. I was overstocked. In fact, at times a single cow would have overstocked my ranch."

While he was serving as a supervisor of his soil conservation district, Zavisch had a chance to see the effect of the first root-plowing and reseeding done in the area. He became convinced that these practices, in combination with the other soil and water conservation work

Note:—The author is work unit conservationist, Soil Conservation Service, Tilden, Tex.



Quail moving to shrub cover after feeding in field of blue panicum on the Harry Zavisch ranch.

he was doing, would mean much to his ranching enterprise.

In May 1955, Zavisch root-plowed and seeded 160 acres of the land most heavily infested with brush. A 2-inch rain brought the blue panicum up to a fair stand.

He kept stock off this area to give the stand a better chance. In September another good rain helped the grass to mature and seed.

During these months the areas still infested by brush stayed grass-poor.

This experience was convincing. Zavisch continued to root-plow and seed at the rate of about 200 acres a year. Over 1,100 acres now have had the benefit of the practices. They show it.

Zavisch cross-fenced the improved areas into 160-acre tracts. This makes it possible for him to defer grazing on each pasture. He periodically moves the cattle from one pasture to another.

In carrying out this part of his conservation plan, Zavisch was always careful to leave brushy cover for wild animals and birds. Along each of the small draws he made sure strips of brush were left. These strips, with the fine grass handy, created an environment that deer and quail like.

One quail-hunting enthusiast declared: "Never saw so many quail in any one place, and I've hunted quail all my life."

"Deer hunting is good on this place, too," another hunter said. "I have plenty of chances to get a deer. I always wait for a big one. I know he'll be along."

Zavisch insists that soil conservation, with its accent on good range management, is the way to successful ranching in his part of Texas.

"I am careful now to keep good grass cover on my land," he says. "The grass checks water loss and controls washing. This means a lot, not only to my livestock operations, but to the wildlife as well on my place."

Catfish Farming

By Brice M. Latham

TWO farmers in Abbeville County, S. C., can furnish firsthand information about catfish farming. They are W. M. Agnew, of Donalds, and C. W. McIlwain, of Abbeville, who tried this new type of farming operation for the first time this year. Both men had stockwater ponds on their farms but had never thought of "farming the water" until the suggestion was made by W. W. Neely, SCS biologist, and W. A. McPhail, SCS technician at Abbeville.

The ponds were stocked on March 17, at a rate of 1,500 speckled bullhead catfish fingerlings (weighing about 50 to the

pound) per acre. After stocking, the ponds were fertilized with 40 pounds of 20-20-5 fertilizer. Feeding was begun April 18, at the rate of 2½ pounds of 36-percent protein hog supplement in pellet form. Food was put in every two to three days thereafter.

In October, the ponds were drained and the fish harvested with a 1½-inch mesh seine. When the net was pulled through the Agnew pond for the first time, about 250 pounds of splashing catfish were pulled out.

Agnew harvested 450 pounds of fish from his ½-acre pond and the 0.8-acre McIlwain pond yielded 485 pounds. The largest fish weighed in at 1 pound and 1 ounce;

Note:—The author is area conservationist, Soil Conservation Service, Anderson, S. C.



Catfish taken from the McIlwain pond. Buddy McIlwain in the background.

the average weight was approximately 10 ounces. Most of the fish were sold to neighbors at 35¢ per pound "on the fin" or 55¢ per pound dressed. The flavor was excellent.

In addition to the edible fish harvested, the ponds were alive with fingerling catfish. Many of these were sold to neighbors who wanted to stock their ponds and begin "farming their waters." Agnew and McIlwain restocked their ponds and plan to harvest the next crop

of fish in June.

Since this was the first time catfish had been grown on hog feed in this section, complete records were kept of all expenses. For the Agnew pond, the cash return for the pond and labor was \$90; McIlwain netted \$143 from his pond.

McIlwain had this to say: "I already knew the importance of proper land use; now I am going to have to start thinking about proper water use, too. I have re-

stocked my pond and am looking forward to another harvest next June. There are still some 'bugs' to be worked out in management; but I can see the potential of two catfish crops per year."

Agnew and McIlwain are co-operators in the Abbeville Soil Conservation District—Agnew was a member of the board of supervisors for a number of years. McIlwain, in addition to operating a farm, is employed by the Soil Conservation Service as a conservation aid.

Cottontails and Bobwhites—

On a Cattle Farm

By Dalton Rushing and R. D. Fisher

W. S. HAMER, owner of 500-acre "Hurricane Hill" farm in Dyer County, Tenn., has proven that cottontail rabbits and bobwhite quail can be produced on a beef cattle farm.

"Hurricane Hill" is widely known for its fine registered Herefords. Hamer is an ardent sportsman, especially fond of quail hunting. He wanted to produce food and cover for birds and rabbits. But most of his acreage is devoted to improved pasture. Good management of pasture usually does not permit adequate food and cover for survival of game species.

When Hamer became a cooperator of the Dyer County Soil Conservation District in 1942, R. M. Wiley, SCS technician, helped him develop a complete conservation plan for the farm, including wildlife conservation. Hamer wanted to set aside a reasonable amount of land for bobwhite habitat. The questions were where, how much, and what kind of habitat?

Protecting wildlife areas from

the cattle appeared difficult. SCS technicians suggested that fence rows could be planted to multiflora rose, but that wouldn't feed the bobwhites. Fortunately, "Hurricane Hill" was uniquely fenced. All cross fences were double, with spacings of 15 to 20 feet between them.

Hamer explained: "This was the only way I could keep my bulls where I wanted them. They could go through a single fence like no fence at all."

Since this double fence was desirable, Hamer agreed to rebuild the fences, spacing them 25 to 30 feet apart. A tentative plan was



Thomas Hamer and conservation officer Floyd C. Hurt standing by a 12-year old planting of multiflora rose on the Hamer farm.

Note:—The authors are, respectively, work unit conservationist, Dyersburg, Tenn., and area conservationist, Milan, Tenn., both of the Soil Conservation Service.

developed, calling for multiflora rose in the fence lines and bicolor lespedeza in between.

There were 12½ miles of double fences separating the farm into small pastures. It took thousands of rose and bicolor plants, which he obtained over a period of three years mainly from the Tennessee State Game and Fish Commission and commercial nurseries.

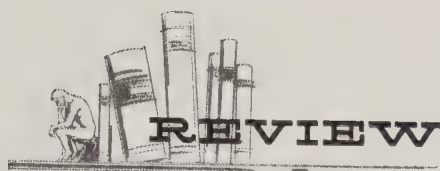
Hamer now has nothing but praise for "living fences." Annual fencepost replacements have been reduced from 2,500 to about 100. "That alone is a big saving," he said. "The rose fence is the most practical and economical fence of any kind for cattle—the cheapest fence you can build—even if you never had a bird or rabbit on your farm."

Rabbits responded quickly to the "briar patch" cover provided by the roses. Pasture grasses and clovers furnished their food. Bobwhites, however, did not increase the first three or four years. The cover and food apparently did not measure up to their requirements. As the plantings matured, however, the birds increased on the farm.

"I have 12 coveys all the time and 2 others that are on the farm part of the time," he said in 1960. "Before the rose and bicolor were planted I had one covey on the entire farm. Nongame birds have also increased. And rabbits are all over the place."

Hamer had hoped for a maximum of 20 coveys of quail, but he is delighted with 12—well above the average anywhere. He hunts the fence rows regularly with one man on each side of the fence.

He figures that his living fences take up about four acres per mile, and half of it should be charged to bobwhite management, the other half to the cottontails and his fencing needs. Thus, he is devoting 25 acres to the support of a dozen coveys of quail. Maintenance is negligible.



EXPLORING THE RIVER. By John and Jane Greverus Perry. 203 pp. Illus. 1960. McGraw-Hill Book Company, Inc.: New York. \$3.50.

IN "Exploring the River," John and Jane Perry have done an exciting and timely job of introducing young readers to the concept of the natural community of a watershed. They help you to explore "Our River" from a spot of damp earth in the mountains to its mouth at the sea. You paddle a kayak and watch bird life along quiet tributary creeks. You learn why a farmer's well went dry. You navigate a power boat on the lower reaches and understand how pollution from silt and sewage affects the livelihood of oystermen. You observe tides and floods and come to know their cause. You delve into the wonders of the life cycle and discover how sun, air, soil, and water work together to make life possible. You find for yourself, as it were, the tragedy and waste of man's abuse of the land. You are left, as John and Jane intended, with a desire to protect these resources—and what is equally important, with some notion of what to do about it.

The Perrys are a knowledgeable and skillful writing pair who have combined sound facts and a zeal for conservation into a highly readable book. Aimed primarily at junior-high-school readers, it is informative and entertaining enough to captivate readers much older.

This book should be on the shelves of all school libraries. All elementary and high school teachers of social and biological sciences—especially those in city schools—should read it for both

inspiration and a better understanding of the complexities of land use and its relationship to the natural and human resources in a watershed.

—D. HARPER SIMMS

NATURAL RESOURCE USE IN OUR ECONOMY. By William H. Stead. Study and Teaching Aids by George L. Fersch. 90 pp. Illus. Revised edition, 1960. Conservation and Resource-Use Education Project, Joint Council on Economic Education: New York. \$1.25.

THIS pamphlet describes the present outlook for our resources and outlines the responsibility of government, business, and individual citizens. The text is written in nontechnical language and discusses the broad nature of our resource problems, involving renewable, nonrenewable, energy, and human resources. It is developed from a knowledge of the physical science aspects of resource use but is designed particularly to explain social science aspects of resource use. Charts based on information included in the President's Materials Policy Commission Report (Paley's Report) illustrate the United States' increasing consumption of resources, our growing dependence upon other countries, and the shifting of our Nation's energy sources.

A new section in this edition, "Generalized and Classroom Learning Activities," supplements the study guide questions which follow each chapter. This section is divided into understandings and activities for "Primary and Elementary" and "Junior and Senior High School" levels. Major conservation and resource-use concepts for teaching are defined and over 150 activities are described for teaching these concepts. Another useful feature of this edition is a double-page chart, "Teacher's Guide to Resource-Use."

—ADRIAN C. FOX

If your address changes, please notify us of your complete new address, including zone or RFD number, and include old address with our code number as shown above.

THINGS TO DO IN SCIENCE AND CONSERVATION. By Byron L. Ashbaugh and Muriel Beuschlein. 163 pp. 1960. Interstate Printers and Publishers, Inc.: Danville, Ill. \$2.50.

THE authors attempt in this handbook to develop a comprehensive understanding of the relationships between natural and manmade resources. They discuss important aspects of space and the solar system; air, water, soil, and minerals; and plant and animal life. They explain the why and how of such man-developed resources as electricity, synthetics, and nuclear energy. The book emphasizes "the drain imposed on the earth's resources by ever-increasing demands of modern civilization," and points out that the depletion of natural resources by larger populations is daily causing more complex and critical problems and obstacles.

The book was designed to help teachers develop improved subject material for instruction in science and conservation, and contains many diagrams and lists of steps to follow in conducting classroom demonstrations and experiments. It also would be a useful handbook for leaders of various youth organizations such as 4-H clubs and Boy and Girl Scouts—as well as a valuable addition to the family bookshelf.

—ALFRED E. BEATY

BIOCHEMISTRY OF PLANTS AND ANIMALS. By M. Frank Mallette, Paul M. Althouse, and Carl O. Clagett. 552 pp. Illus. 1960. John Wiley & Sons: New York. \$8.50.

This book is an introductory text on biochemistry as applied to plants and animals. It is written primarily for undergraduate students, but it will be useful to others who are interested in biochemistry.

The authors, all of whom are in the Department of Agricultural and Biological Chemistry at Pennsylvania State University, have covered a wide variety of subjects in this phase of agricultural science.

The text consists of three major parts. The first deals with general biochemistry in which carbohydrates, proteins, lipides, enzymes, and energy relationships are discussed. Part 2 consists of information dealing with plant structure, metabolism, seed germination, nutrition, and growth. Animal biochemistry makes up part 3 with chapters dealing with body tissues, vitamins, minerals, feeds, digestion, metabolism, etc. A list of references is included at the end of each chapter.

In addition to the well-written material in the body of the text, a 15-page appendix contains useful information on the chemical composition of foods, and nutrient requirements of man as well as animals.

—B. D. BLAKELY

Employees of the Soil Conservation Service submitted 8,203 suggestions for improved procedures or techniques during fiscal year 1960. Of these, 207 suggestions resulted in \$7,215 being paid to employees for tangible and intangible benefits that resulted in a savings of \$45,842.71 to the Service.

During the fiscal year 1960, the Soil Conservation Service assisted the Foreign Agricultural Service with the development of 147 new training programs for foreign nationals. These programs involved 334 people from 60 countries. Of these, 180 came as individuals, while 154 came in 15 groups of from 6 to 23 persons.



APRIL 1961

Soil Conservation





Growth Through Agricultural Progress

"We have grown accustomed to dealing with great rivers, with their large problems of navigation, of power, and of flood control, and we have been tempted to forget the little rivers from which they come."

—FRANKLIN D. ROOSEVELT



COVER PICTURE.—Combination grade-stabilization and floodwater-retarding structures on the Brownell Creek watershed in Otoe County, Nebraska, with land treatment measures that include terracing, strip cropping, and contour tillage.

VOL. XXVI, No. 9

APRIL 1961

CONTENTS

PAGE

- 195 Watersheds—Natural Units for Conservation Programs
By Donald A. Williams
- 196 Kiowa Serves as Pilot for Watersheds in Colorado
By Herbert I. Jones
- 199 Sick Watershed Gets Treatment
By D. E. Sloan
- 201 Flood Problems on Florida Flatlands
By Sellers Archer
- 203 Local Financing of Watershed Projects
By John I. Kincaid
- 205 Oklahoma District Sponsors Water Safety
By Ray Walker
- 206 Multiple Benefits on the Shakopee
By Robert S. Anderson
- 208 Hydrologic Relationships on Watersheds in Ohio
By Lloyd L. Harrold
- 210 Taming the Pit River
By Arnold E. Bullock
- 212 The Ladies Help Steer
By Herbert I. Jones
- 213 Fertilizing Flood Prevention Structures
By James Guillory
- 214 Saving and Using the Runoff
By Donald N. Davison and Verl G. King
- 215 Hans L. van Leer—A Profile
By Lester Fox

Soil Conservation

ORVILLE L. FREEMAN
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

TOM DALE, Editor

15 CENTS PER COPY

FOREIGN—\$2.25 PER YEAR

\$1.50 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Watersheds—Natural Units for Conservation Programs

By Donald A. Williams

JUST as we recognize that an individual farm or ranch is the most practical economic unit to deal with in installing a coordinated soil and water conservation program, we must recognize that a watershed is the natural unit for such a program in most areas. Nearly all our water problems are watershed problems; that is, the best long-range solution usually depends on the proper use, treatment, and management of an entire watershed. Most of our soil conservation problems, except those directly related to wind erosion, can best be solved by proper management of an entire watershed.

A watershed is a natural unit for conservation operations regardless of its size—whether it covers only a few acres culminating in a gully or grassed waterway, or encompasses a large river basin that stretches across several States. But current emphasis centers on the “creek-sized” watersheds, covering from a few thousand to a few hundred thousand acres. Such watersheds are large enough that substantial downstream benefits may accrue from upstream treatment, yet small enough that adequate treatment by community action may be completed in a few years.

The Soil Conservation Service has always recognized that watersheds were natural units for soil and water conservation operations. Most of the early demonstration projects of the Service were small watersheds. Likewise, many of the early soil conservation districts were organized on watershed boundaries. But the present widespread interest in “creek-sized”

watersheds has sprung up mainly during the past few years, particularly since Congress passed the “Small Watershed Protection and Flood Prevention Act” (Public Law 566) in 1954.

The current enthusiasm for small watershed projects, under provisions of Public Law 566, may be attributed largely to two things: (1) They are local projects sponsored by local organizations, though they receive Federal and State assistance. Thus, such projects are started only in communities where there is genuine local interest and demand. (2) Most of them are multiple-purpose projects, whereby most segments of the community are affected and benefited. They provide not only for erosion control, flood prevention, and sediment control. They also may provide water for livestock, irrigation, wildlife, and recreational uses; and, in some cases, water for municipal, industrial, or other uses.

The broad authority of Public Law 566, as amended, permits Federal assistance on small watershed projects for almost any type of productive or conservation use of water and related resources. Each project may be tailored to fit the needs and desires of the people living in the watershed. It offers an opportunity for the people of a community—town and country people alike—to coordinate their efforts toward achieving the greatest good for the greatest number in the use and control of the natural resources of their watershed. The main requirements are that local people and sponsoring organizations develop a program

and assume their share of the responsibilities and costs, and that the project be economically feasible—that is, the benefits must exceed the costs.

We must not assume, however, that the treatment of whole watersheds is the only soil and water conservation job. A great majority of the Nation's farms and ranches do not lie within watersheds that have been organized for action under the small watershed program. Even though applications for Federal aid under this program had been made for more than 1,400 watersheds covering nearly 100 million acres by the end of 1960, this still represented less than 15 percent of the small watersheds and less than 10 percent of the acreage in them that needed comprehensive treatment of some type. Furthermore, the conservation treatment of the land—acre by acre and farm by farm—is the first, and usually the most important, step in the treatment of any watershed. Floodwater retarding structures and debris basins will likely be short-lived unless the farm, range, and forest lands above them are given proper treatment.

Hence, our foremost goal still must be to help all farmers and ranchers establish conservation programs whereby they will use all land within its capabilities and treat it according to its needs for protection and improvement. Nevertheless, modern needs and demands require the watershed approach to the solution of many community-type problems wherever local organizations are willing to take the initiative and responsibility in such work.

Kiowa Serves As Pilot

For Watersheds in Colorado

By Herbert I. Jones

IF the pilot watershed projects authorized eight years ago were intended to foster similar activities on the part of local groups, then the Kiowa project in Colorado is a resounding success.

Since work began in 1955, thousands of farmers, ranchers, and community boosters from all parts of the State have looked over the Kiowa watershed work and liked what they saw.

Visitors from 19 neighboring watersheds watched closest as the pilot plan developed, and resolved to follow Kiowa's lead.

The result is a growing nucleus of upcoming projects encompassing 1,750,000 acres in central Colorado. Two of the projects—West Cherry Creek and Big Sandy Creek—are under construction. The Coalbank, Vineland, Fishers Peak, and Franktown-Parker projects are approved. Twelve other watersheds in the area are under active study or awaiting preliminary inspection.

Meanwhile, on all the projects under Kiowa's wing, conservation practices are going on the land at a stepped-up pace. Supervisors of sponsoring soil conservation districts and the SCS men assigned to help them are achieving these gains with an increasing number of complete farm and ranch plans.

The upsurge in soil and water conservation work in central Colorado is credited almost entirely to the influence of the Kiowa pilot project. Kiowa is 75,000 acres of practical dollar-for-dollar conservation in an area of sandy soils and steep slopes. Tributary creeks drop 100 to 200 feet per mile and the



The main channel of Kiowa Creek is a sand-choked, mud-baked land hog that meanders across the Colorado landscape at will when heavy thundershowers come: (above) Aerial view of Kiowa Creek as it passes Elbert, Colo.; (below) a closeup view of the Kiowa channel during normal, nonflooding times.



Note:—The author is information specialist, Soil Conservation Service, Denver, Colo.

main creek as much as 50 feet per mile.

The effort to curb rampaging runoff from this watershed has made a mark on the land and in the hearts of the people who know it.

When the last shovelful of earth is turned early this year, Kiowa boosters will be able to point with pride to 62 major floodwater dams. Some will be nearly 60 feet high and a half-mile long, and will contain close to 175,000 cubic yards of earth fill. In addition, there will be 7 sediment control dams and 15,000 feet of channel improvement. Land treatment will include 6,000 acres of grass seeding, 50,000 acres of properly managed range, miles of new terraces, new contouring, waterways, and other conservation work estimated to be two-thirds of a practical goal. All this in spite of four years of drought.

The Kiowa project is designed to cope with the cloudburst storms that periodically sweep the 7,000-foot Black Forest highlands. The structures can easily contain 25-year floods, and 50-year sediment storage is provided. Ungated outlets are set to release all floodwater in 36 hours.

The area's 900 citizens, its towns, roads, and bottomland fields will be spared losses that have run over \$42,000 annually during the history of the community. The residents will gain, too, from an added \$21,000 annual increase in use of their lands guarded from flooding.

But nature doesn't hold off storms, as all Coloradoans know, waiting for watershed work to be done on Kiowa Creek or elsewhere.

Kiowa watershed construction was barely underway when the project got its first test, on July 30, 1957. That afternoon, one dam, known as K-79, proved its worth in a matter of hours.

The storm began with over four inches of rain pelting down in 45 minutes. Pine-grama-wheatgrass pastures and creek-bottom fields of



Map of central Colorado, depicting small watersheds that are in various stages of organization, planning, or treatment mainly as a result of the successful treatment of the Kiowa Creek pilot watershed project.

the subwatershed were all but drowned in the downpour. Ten minutes later water was flowing out the pipe spillway of K-79.

In another hour the emergency spillway was discharging a river 142 feet wide and 2 feet deep. Service engineers report outflow reached 1,480 cubic feet of water per second.

The 2,262 acres above K-79 produced an inflow of 5,880 cubic feet of water per second which was cut to the 1,400 figure by the functioning dam.

While runoff exceeded that expected from a 100-year storm pattern, the earth dam and spillway were undamaged. Luckily the storm fell on only a portion of the Kiowa watershed—the protected part.

When Coloradoans learned that more than \$12,000 in damages was prevented by one dam in one storm, Kiowa's leadership was assured.

Twenty-two years earlier, on Memorial Day in 1935, Kiowa residents were not so fortunate, nor was there any Kiowa watershed work to guard them at the time. When the "big one" ended that day, losses ran over \$2 million. Six persons died.

Not long after the disaster, rancher Dewey Carnahan sought out neighbors and friends to start what eventually became a five-county watershed improvement group. From then until the advent of the pilot watershed program, Carnahan and his group pleaded for recognition.

Their zeal rubbed off on others, particularly on Bob Appleman, who became the SCS work unit conservationist in the early 1940's, and on Kiowa district supervisor-ranchers Sam Kimzey, Tom Scott, Jim Foushee, Bill Eisendrath, Joe Jarvis, and Kenneth Sharp. Businessmen, county commissioners, and community-minded citizens also joined the effort. E. G. Kruse was elected chairman of the district watershed advisory committee.

Groundwork by these men resulted in Kiowa being named a pilot project within weeks after Congress approved the legislation. Later on, Kiowa was picked as one of 8 pilot watershed projects in the Nation to be fully studied to pinpoint benefits of the work.

Reminded recently that the effort has cost him and his neighbors 25 years' work and a good deal of money, Carnahan replied, "It's worth every cent and every minute."

Actually, the \$12,000 spent so far by the Kiowa Soil Conservation District is only part of the contribution made by the sponsors. A truer figure runs near \$85,000. Elbert County has helped, too, by sending heavy equipment to build one floodwater dam.

The county commissioners reaped benefits from the job last spring. During the biggest snowmelt runoff in history, many unprotected road culverts in the area washed out, but not the ones below the watershed work.

Elsewhere in the State, watershed boosters are just as enthusiastic about their own projects. But they are quick to admit that the Kiowa pilot project paved the way.

Hi White, manager of the Wray Colo., Chamber of Commerce and contracting officer for the Wray watershed project, contends that

without Kiowa's lead he would not have really understood small watershed possibilities.

Under the leadership of White and the Hale Soil Conservation District the Wray watershed project has developed into a \$214,000 effort to reduce flood damages to the city and the adjoining agricultural area. Possible damages now are less than 15 percent of what they once were. Control of the 2,500-acre watershed is almost a reality.

Fishers Peak sponsors hope their \$270,000 watershed project, approved last June, can duplicate the Kiowa and Wray benefits for the City of Trinidad. A benefit-cost ratio of 1.8 to 1 suggests they can.

The Big Sandy watershed project adjoining Kiowa on the south is being built almost solely for agricultural benefits. Land treatment and 15 floodwater dams will return \$1.50 in benefits for every dollar spent. The total Big Sandy watershed protection program will cost nearly \$1,249,000.

Before Congress adjourns this year, other central Colorado projects may move from the application-inspection stages to become full-scale developments. At the present time, Home Supply, Crooked Arroyo, and Running Creek seem the best possibilities.

All these projects are being nurtured by farmers, ranchers, and townspeople who are impressed by the things they see at Kiowa. As planning goes ahead, more and more sponsors are filing applications with the State soil conservation board. In the process more and more groups and individuals are casting their lot with watershed sponsors. Already railroads, irrigation companies, pipeline companies, wildlife interests, municipalities, stockmen's groups, farmers' organizations, and many others are joining with local landowners, soil conservation districts, county and State governments, and all the assisting Federal agencies to get watershed conservation done.



A typical gully in the Kiowa Creek watershed.

Sick Watershed Gets Treatment

By D. E. Sloan

SICK land, like sick people, needs a careful diagnosis, then the right prescription, and finally an applied treatment. This is what the folks in the Elk Creek watershed in Washington County, Ind., have discovered by practical experience. Now, with most of the treatment applied, the symptoms of sick land are disappearing fast: the malignant erosion and flooding conditions are being cured.

The landowners in the Elk Creek watershed diagnosed the "sickness" as deposition of infertile silt and debris in the channel of the creek and on the flooded bottomland. The silt came mainly from 18,020 acres in the upper part of the watershed. The landowners on the upland could not afford to lose their topsoil, seed, lime, fertilizer, and other tangible property. The landowners on the floodplain could not afford to have the infertile silt and debris covering their fertile bottomland and filling the Elk Creek channel and tributaries.

What did they do about it? Let's ask Joe Seifres, president of the Elk Creek Conservancy District. "We started holding neighborhood meetings to try to determine whether there was enough interest to justify asking for assistance," Seifres says. "As soon as Public Law 566 was passed by Congress, the landowners petitioned for assistance. We soon found that getting the facts together and presenting them to the people would be our biggest job. Since our project was the first one in Indiana, we had nothing to show our people."

Melvin Garriott, local contracting officer for the Conservancy District,

who farms 360 acres in the watershed, says, "Our job would not have been so difficult had we done a better job of informing the people in the beginning. The educational part of these programs is by far the most important part of the job."

What about the prescription for the problem? Merle McCoskey, who farms 350 acres with his brother, said, "We soon found that water does not pay any attention to line fences. Everyone could see that the way to prevent floods was to catch the water where it hits the earth. We know that it is less expensive to prevent floods than it is to control them after they come. It is less expensive to do this watershed type of flood prevention than it is to build levees and large dams only to have them fill with silt."

Hager Garriott, Jr., secretary of the Conservancy District, says: "The prescription for our flood problem is, without doubt, good land-use treatment on the upland, coupled with detention structures above the bottomland."

How was the prescription applied to the problem? Four of the detention structures were installed after the land above them was given proper land-use treatment. The remaining three structures, stream channel work, and land treatment on the upland will be installed as scheduled.

How have the measures performed? Hager Garriott, Jr., says: "The principal spillways were more than adequate to carry a 5-inch deluge this summer. The multiple-purpose structure on my farm will provide adequate irrigation



Sick land in the Elk Creek watershed that will get conservation treatment under the watershed protection program.

Note:—The author is work unit conservationist, Soil Conservation Service, English, Ind.

water for my cabbage, beans, and sweet corn."

Paul Garriott, Jr., who farms in the extreme lower end of the watershed, says, "Generally, a 2-inch rain over the entire watershed will flood my land. We have had three 2-inch rains since the four detention structures were installed, without flooding. The 5-inch rain in June flooded me, but I feel sure that it would not have caused any

damage if all the other structures and the land treatment had been completed."

Merle McCoskey sums it up: "This watershed program has opened our eyes. We are proud to have been the first in Indiana. Everything that has been installed has worked perfectly. We now know that crop damage from flooding will be a thing of the past."

According to Scifres, the out-

standing thing has been the splendid cooperation of the land-owners and county, State, and Federal organizations to keep the watershed project on schedule. "This cooperation has got to come first, or these projects will not move ahead," he said.

What has this program cost? The total cost will be approximately \$500,000. The Federal Government will cost-share about 50 percent, and the local land-owners and the State will share the remainder. Most of the local share, to date, has been met by voluntary contributions of land and services from the people.

The Indiana Division of Fish and Game assisted the Conservancy District in purchasing the land and cost-sharing on a multiple-purpose structure, built for flood prevention with a permanent water pool for public recreation, primarily hunting and fishing.

The Elk Creek Conservancy District and the Washington County Soil Conservation District are the local sponsoring organizations.

The Washington County Soil Conservation District, as a sponsoring organization, assumes responsibility for the major technical assistance of Soil Conservation Service technicians, and also works with other county, State, and Federal agencies in helping to get soil and water conservation practices applied to the land.

The Elk Creek Conservancy District is responsible for the administration of operations, management, and maintenance of the watershed works of improvement in the watershed program.



Contour farming stored about 2.5 percent more of the annual precipitation than is stored in farming with the slope in recent Kansas experiments. However, contour farming with terraces increased moisture storage by about 5 percent.



A multiple-purpose floodwater retarding structure on Elk Creek watershed that furnishes water for irrigation, domestic use, and recreation: (above) The dam site before construction; (below) the permanent pool behind the floodwater retarding structure.



Flood Problems On Florida Flatlands

By Sellers Archer

IN an 8-day period last fall, Hurricane Florence dumped up to 15.5 inches of rain on two adjoining watersheds on the east coast of Florida. They were the Sebastian River Drainage District which had been approved for operations under Public Law 566, and the Fellsmere watershed which was in the process of organizing. Both had partially effective drainage systems.

Floodwaters covered nearly 70,000 acres of the 81,400 acres in the two watersheds. Much of it remained for 20 days. Damage was estimated at \$208,900. Watershed planners believe that if both areas

had been treated with projects such as the one planned for the Sebastian Drainage District, damages would have been reduced by \$141,900.

The storm gave SCS technicians an opportunity to measure the hydrologic and economic planning procedures used in the flatland watersheds of Florida. Water stood in citrus groves, sugarcane fields, and pastures for varying lengths of time—up to three weeks. Watershed economists and plant technicians were able to observe damage done to the crops by the varying periods of inundation. This information is added to studies of damage done during other periods of

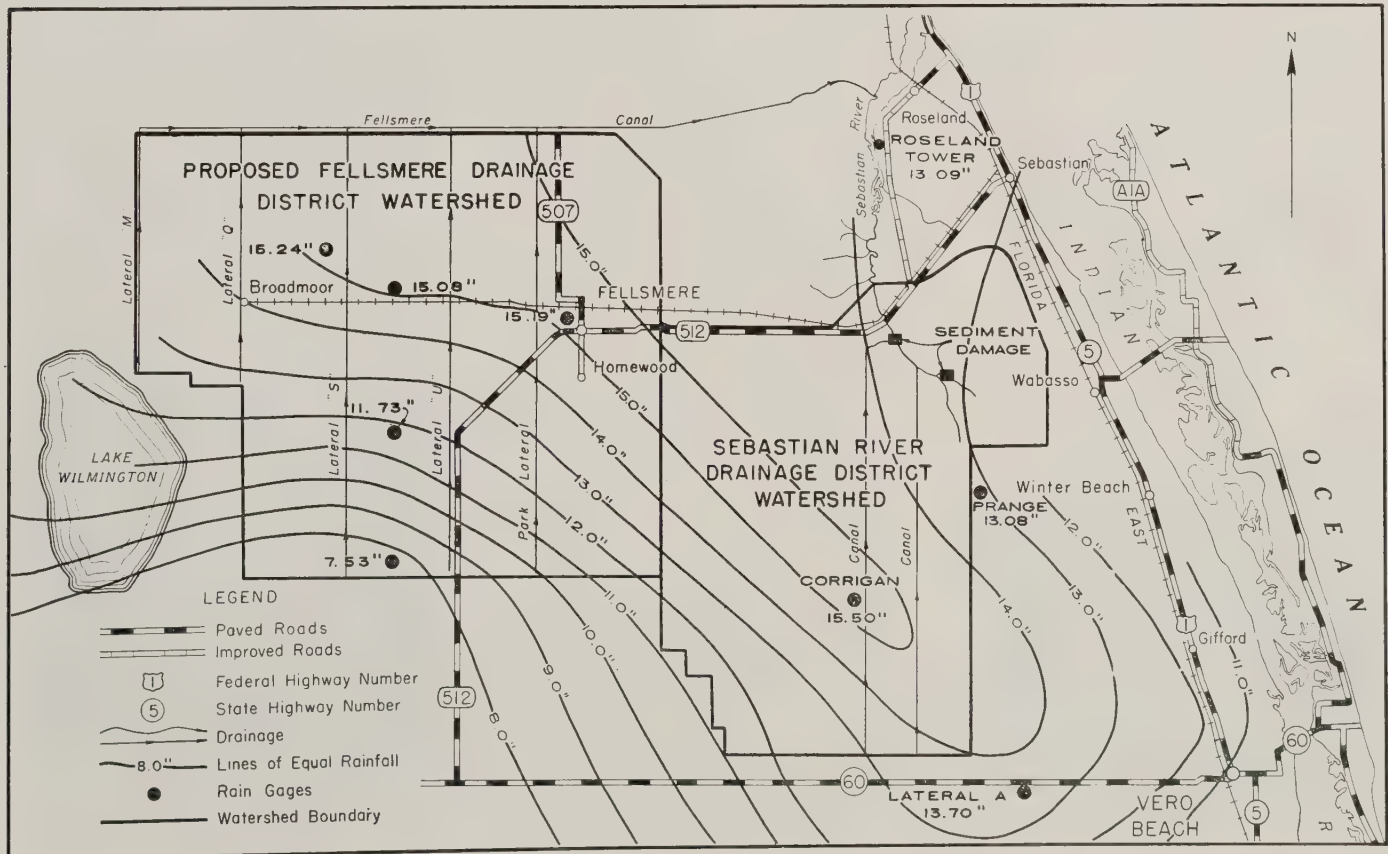
the year.

"The sum of this information sets up the problem for the hydrologist," according to H. T. Stanley, assistant State conservationist for watersheds. "He must measure, in advance, the effectiveness of works planned to remove the water from the land within a specified time."

Right answers are necessary when dealing with high-value crops. They are all-important to Florida growers who will depend on watershed projects. For example, a \$700,000 celery crop was lost in 1958 on the Sarasota-West Coast watershed across the peninsula.

"We first plan measures to handle the runoff from one-day,

Note:—The author is information specialist, Soil Conservation Service, Spartanburg, S. C.





Citrus grove in Fellsmere drainage district after hurricane Florence had passed.

high-intensity storms," said Stanley. "Then we see how well these measures will handle the runoff during extended storm periods."

The soil was saturated when the eight-day storm began. Highest intensity of rainfall occurred on the third day. Five inches fell in a 4-hour period, and 7 inches fell in the 24-hour period.

Humidity was high and there was little evapo-transpiration. Practically all of the water had to be removed through inadequate canals. Water moves slowly in the flatlands. Fellsmere Canal, which drains most of the area, did not crest until four days after the heaviest rains fell.

"This points up the problem in hydrology," explained D. H. Esry, SCS watershed planning party leader. "Where runoff is faster, measures to reduce damage from

the high-intensity rain may be sufficient. The 1-day rain of 7 inches can be expected on an average of once in 8 years. That is a big rain, but to handle it is a fairly simple problem. It is more difficult to handle the water during an extended storm period. Continuing rains complicate the problem. Larger canals may be required."

Marion Holder, economist on the SCS team, outlined the flood tolerance of the crops to be protected.

Citrus trees in the Indian River area are grown on beds to give the roots two to three feet of soil above the water table. Flooding can be tolerated from 24 to 36 hours with only minor damage.

"The storm being studied inundated 1,900 acres of citrus from 3 to 7 days," he said. "Yields will be reduced. Permanent tree damage, which may not be seen for six months to a year, is inevitable. Our information indicates that damage will be from 40 to 80 percent. In that range, growers often destroy the groves and replant. Citrus loss was estimated at nearly \$100,000."

Water covered 6,800 acres of sugarcane from 1 to 2 weeks. The cane was not seriously damaged by flooding, but the resulting delay in harvest and other costs ran the bill up to about \$37,000.

Ten thousand acres of improved pastures were flooded up to 20 days. Four plots were set up to

study residual damages. The first three are on the Pat Corrigan Ranch, and number four is on the Kenmore Ranch.

Plot 1 contained pangolagrass grazed to a 6-inch height to permit volunteer reseeding of Southern white clover, which was up to a good stand when the flood came. All of the clover and 5 percent of the grass were killed. A month later the grass had recovered. Clover seed was sprouting again, but the legume, which was to furnish January-to-June grazing for Corrigan's cattle, will come into production about three months late.

Plot 4 had been similarly managed. The clover was killed. A month later the legume seed was sprouting, but carpetgrass and common bahiagrass were continuing to deteriorate.

Plots 2 and 3 were in fields of ungrazed pangolagrass saved for winter forage. Roughage was lost, but a month later the grass had begun to grow again.

Pasture damage was estimated at \$50,500 in loss of immediate pasture, loss of clover stand, and resultant loss of winter grazing. No estimate was made of added feed and handling costs.

"The sum of many studies like these will enable us to sharpen the definition of the level of protection needed," said Stanley.

James W. Woodfin, hydrologist of the party, pointed out that the



Entrance to the Corrigan ranch after 15 inches of rainfall.



Sugarcane field in the Fellsmere drainage district after hurricane Florence passed.

rainfall pattern in the area is extremely varied.

"Average annual rainfall is 52 inches, but 39 inches of that comes in a 6-month period. About once every 8 years the annual rainfall jumps to about 70 inches. Then, too," he said, "severe rainstorms like the one that followed hurricane Florence may hit at any time."

Stanley and his group discuss the probability of these storms with the local group. "If they decide they want 50 percent protection during the largest storm expected on an average of once every 50 years, and complete protection from the 10-year storm, we have our problem," Stanley added.

"We then know that we must remove the runoff of the smaller storm from the citrus groves in 24 hours, remove water from sugarcane in 4 or 5 days, reduce the area of pasture flooded, and reduce the length of inundation on the remainder.

"The larger storm must be considered, too. If storm damages are to be reduced by half, the economist and the plant technicians determine how much reduction in area and duration of flooding will be necessary to accomplish this goal."

So the problem is set up and turned over to Woodfin. Woodfin "routes" the storms through ditches and canals or pumps of various sizes. He makes adjustments in specifications until the plan will meet the objectives.

Before the proposed solution is presented to local sponsors, the economist again comes into the picture. He calculates the benefits which will accrue. He compares these benefits with the cost of the proposed works of improvement. Benefits must exceed the costs.

"In the flatlands where water moves slowly," Stanley concluded, "we must plan the works of improvement so they will be effective during the short period of intense rainfall as well as the longer storm period."

Local Financing of Watershed Projects

By John I. Kincaid

FINANCING their portion of the cost is one of the major problems confronting sponsors of small watershed projects under the Watershed Protection and Flood Prevention Act (Public Law 566). Many projects with completed plans are yet to get into construction because of the inability or failure of local sponsoring organizations to meet their share of the cost.

A complete understanding by local people of their responsibilities in a watershed project is essential to the success of the project. The earlier this understanding is achieved, the better.

One of the first things that must be realized is that the local people must finance their part of the program, and the cost can run to a sizable sum. It is difficult to "poor boy" a project, especially a large project, to completion by contributions or arranging for other agencies to provide financing on a piecemeal basis.

In most instances the officers of local sponsoring organizations, particularly water control and improvement districts, are not in a position to perform all details necessary for successful operation of a project. They need legal, administrative, and secretarial help.

Financing needs may be broken down into at least four categories: Administrative, land rights, legal, and operation and maintenance.

Administrative costs include such items as furniture and office equipment; office space and other rentals; clerical help; administrat-

tion of contracts; and such miscellaneous items as stamps, insurance, social security, bonds, and numerous other items or services.

Only the local sponsoring organization can estimate the cost of most of these items since they will vary depending upon the size of the project, amount of time directors and others devote to the project without charge, type of help employed, and many other local factors.

The cost of administering contracts alone may be considerable. It may include preparing and distributing bids; advertising for bids; travel in connection with checking equipment and financial status of successful bidders; working with contractors in negotiating and preparing modifications; handling claims and disputes of contractors; preparing partial payment estimates; making semifinal and final inspections; and preparing construction reports. This may entail paying a full-time salary to the contracting officer, especially on large projects. On the basis of our experience in working with local organizations, we believe that an average of about \$500 per contract is a satisfactory figure for estimating these costs.

Land rights costs will vary greatly. Even where easements are donated, the costs will include such things as obtaining necessary signatures and recording of easements, negotiated damages, and installation of improvements not covered in the plans and specifications, such as ramps, bridges, and fences, and removal of buildings, utility lines, and other improve-

Note:—The author is area conservationist, Soil Conservation Service, Austin, Tex.

ments. These costs, not including condemnation and negotiated damage costs, may average \$200 per structure or more, depending on local conditions.

The local sponsoring organization should realize in the beginning that it may have to purchase some land rights and will have other expenditures in the form of negotiated damages. The amount of funds required can only be estimated and here again judgement of local people must be relied upon.

The watershed work plan should contain an estimate of the values of the land rights to be furnished by the local sponsoring organization. These values can be used as a basis for estimating the cost of any easements that must be purchased.

Another approach might be to take the total acres planned in the sediment and detention pools of all structures in the watershed, and estimate the percentage of that acreage where land rights might have to be purchased. By using a per-acre evaluation for each—for example, \$100 per acre for sediment pool acreage and \$50 for detention pool acreage—an estimated amount needed for purchase of land rights could be determined.

In addition to this figure, an estimate of the cost to the sponsoring organization for relocation of roads, power lines, pipelines, improvements, and other miscellaneous costs in connection with land rights should be included.

Legal costs may include drafting easements and checking for legal adequacy, representation of the sponsoring organization in condemnation proceedings, and any other legal actions that may arise. Legal costs can be estimated only by local people. However, based on the experience of local sponsoring organizations now in operation, it appears that \$200 per structure is a fair estimate of overall costs.

This figure will vary considerably, depending upon number of land rights involved, complications

such as estates, and whether or not condemnation proceedings are necessary.

Operation and maintenance of works of improvement after construction is completed are the responsibility of the local sponsoring organization. The amount of funds required for this purpose will vary with the watershed, type of structures installed, and methods used by the sponsoring organization to carry out its maintenance responsibilities.

In discharging its obligations for operation and maintenance, the sponsoring organization must provide sufficient funds to maintain vegetative cover on structures and emergency spillways, control brush and weeds, maintain fences, remove debris from principal and emergency spillways, and make necessary repairs to structures or spillways. The cost will vary from year to year and with local conditions.

The local sponsoring organization must enter into an agreement satisfactory to the Administrator of the Soil Conservation Service prior to the construction of works of improvement. The agreement includes arrangements for defraying these operations and maintenance costs.

In Texas the sponsoring organizations provide a reserve fund of up to \$25,000 for operation and maintenance, depending upon the number of units of construction. This is based on a formula of \$1,000 per structure for the first 10 structures or first 10 miles of channel improvement, \$750 per structure for the second 10 structures or miles of channel improvement, and \$500 per structure or mile of channel improvement for remaining units until the \$25,000 maximum is reached.

This reserve fund is accumulated by setting aside \$200 per structure or mile of channel improvement each year until the required maintenance fund is obtained. This fund is maintained by replacing annual expenditures at a rate of

\$200 per year per unit of construction until the fund again reaches the required reserve. If the structure provides for multiple-purpose storage, the amount of funds for operation and maintenance is increased according to the cost for the added purpose.

To assist the local sponsoring organization in planning for necessary funds to carry out its financial responsibilities for the project, an overall budget should be developed to determine both annual and long-term needs.

How financing is provided is a matter to be determined by the sponsoring organizations. Since their legal powers of taxation vary greatly, depending upon the legislative or other acts creating them, such powers should be clearly determined before deciding on how necessary funds will be raised.

Usually a combination bond issue and an annual operation-and-maintenance tax offer greater flexibility and adaptation to the sponsors' needs.

Regardless of the financing method used, the size of the project, or the type of local sponsoring organization, an assured source of adequate income is essential and should be provided for as early as possible.



A South Carolina farmer finds the watershed program helpful to honey production. J. H. Patten, of Pickens, S. C., said: "Four or five years ago I had to leave enough honey in each gum for the bees to winter on when I robbed them in June, because the bees couldn't find enough plants that had blossoms during the later summer months. The watershed program brought bicolor and sericea lespedeza to nearby eroding fields and power line rights-of-way, and my bees now can feed on the blossoms from these plants. They produce twice as much honey as before."



Good weed control begins with clean seed.

Oklahoma District Sponsors Water Safety

By Ray Walker

SUPERVISORS of the Deer Creek Soil Conservation District scored a first in Oklahoma when they sponsored water safety demonstrations at Cobb Creek Flood Prevention Site 1, on July 10, 1960. A crowd estimated at 500 saw the various demonstrations held on the 158-acre lake, south of Weatherford.

The idea originated when the supervisors met with a committee of State and National representatives of the American Red Cross and the Soil Conservation Service. In addition to enlisting the cooperation of these two organizations, the supervisors asked help from the Southwestern State College at Weatherford, the Oklahoma Highway Patrol, the City of Weatherford, and sportsmen's clubs. A. M. Clements, SCS area conservationist, served as master of ceremonies.

Purpose of the event was to educate the using public and adjacent

Note:—The author is State conservationist, Soil Conservation Service, Stillwater, Okla.



One of six Red Cross rescue stations installed at the waterfront of the Cobb Creek lake by the Deer Creek Soil Conservation District.



The senior group of performers and instructors at the water safety show on the Cobb Creek lake.

landowners to the hazards of water recreation and to help develop a water safety consciousness. The need of such a program was urgent.

On Sunday, June 26, there were 40 boats and about 75 automobiles at Site 1. The people came to picnic, swim, ski, fish, and just have a good time. There were no lifeguards, no defined swimming area, no plan to control speedboat traffic on the lake, and no authority to enforce regulations had there been any. Just two weeks before the committee's visit, a college student lost his life trying to swim to a platform built far out in the lake.

The water safety demonstrations centered around six Red Cross Rescue Stations installed at the waterfront by the Deer Creek Soil Conservation District. Dan Hamill, SCS work unit conservationist, worked closely with the district supervisors in planning and staging the event.

Trained personnel demonstrated various types of equipment and rescue skills. Performers were members of the Senior and Junior Groups representing the Southwestern State College and City of Weatherford Recreation Swim Program. The program was directed by Dr. L. J. Van Horn, Water Safety Instructor Trainer, and Mrs. Glen Wright, Water



A demonstration on how to throw a life buoy for rescue operations at Cobb Creek lake.



Lt. Sid Barry (right) and patrolman Dan Combs of the Oklahoma State Highway Patrol Rescue Squad, who gave lectures and demonstrations on water safety at Cobb Creek lake.

Safety Instructor, both faculty members at Southwestern State College.

Charles Hartshorne, American Red Cross Water Safety and First Aid Services Director from Oklahoma County, explained the expert skier demonstration with 6 boats and 12 skiers. In his lecture, Hartshorne placed emphasis on having a third person in the boat. Winston Humphries, Southwestern State College student, read ski safety rules. Boats for the demonstration were provided by sportsmen's clubs.

Members of the Senior and Junior Life Saving Groups demonstrated approaches, releases, and carries in rescuing persons in danger of drowning. Use of a reaching assist also was demonstrated by two young swimmers trained in the Weatherford Recreation Swim Program.



State highway patrolman adjusts SCUBA gear before entering water for a demonstration at Cobb Creek lake.

Oklahoma Highway Patrol officers demonstrated the use of SCUBA equipment (self-contained underwater breathing apparatus) that held the undivided attention of adults and had the youngsters believing that a "man from Mars" had come to the event. The team also gave lectures and demonstrations of their specialized work and use of equipment on their rescue service truck.

The demonstration areas were "plastered" with colorful water safety posters provided by Richard Brown, Director of Water Safety of the American Red Cross, Washington, D. C. Joseph Racz, Red Cross field representative in Oklahoma City, gave valuable assistance in planning and staging the water safety show.

Increasing public use of the more than 1,500 floodwater lakes built under the small watershed and flood prevention programs has created a serious public water safety hazard. The need already is apparent for a program that will: (1) "Engineer" safety into the basic plans for construction; (2)

alert and educate the using public to the hazards of water recreation and how to cope with them; and (3) determine and provide authority for enforcement of water safety rules.

At the present time in Oklahoma, there is no clear-cut understanding among boards of supervisors, public law enforcement officials, landowners adjacent to the reservoirs, or others as to responsibilities in permitting such recreational use, their liability in the event of tragedy, or their power to enforce regulations governing the safe use of these facilities. These problems are not confined to Oklahoma. The situation usually exists wherever there is an expanding watershed program.

The need for taking positive action to solve these problems and to safeguard the rights of the districts and landowners and the lives and rights of the using public is very urgent. Water safety shows similar to the one sponsored by the Deer Creek Soil Conservation District probably will be held in many sections of Oklahoma in 1961.

Multiple Benefits on the Shakopee

By Robert S. Anderson

SHAKOPEE Creek is a principal tributary of the Chippewa River in western Minnesota. The Shakopee watershed, which includes about 205,000 acres of farmland, is part of the Chippewa Tributaries and Hawk Creek pilot watershed protection project.

Note:—The author is work unit conservationist, Soil Conservation Service, Montevideo, Minn.

Flood prevention, erosion control, and reduction of sediment damages to farmland were the principle objectives outlined in the work plan for the Shakopee watershed. But developments have proved that waterfowl, upland game, and other wildlife also are principal beneficiaries of the watershed program as it nears completion.

Structural measures, including 2 floodwater retarding structures and 25 miles of floodway improvement, have been completed on the Shakopee. Land treatment measures in the upper part of the watershed are being applied by farmers at a stepped-up pace and are proving effective in controlling runoff and erosion. Flood and sediment damages to the lowlands were practically nonexistent in 1960.

The floodway, completed in 1959, not only controls flooding of adjacent farmlands, but also provides an outlet for farm drainage ditches. The two large floodwater retarding structures have, up to now, kept floodwaters down to the capacity of the floodway; and, in addition, they have created permanent lakes from formerly intermittent lakes and greatly enhanced their value to waterfowl and other wildlife.

The storage reservoir in the upper floodway is Swan Lake in Kandiyohi County. It has a surface area of approximately 700 acres and temporary storage capacity of 3,000 acre-feet. The storage reservoir in the lower floodway is Shakopee Lake in Chippewa County. This lake has a permanent pool of about 300 acres and has a temporary storage capacity of 2,000 acre-feet with a surface area of approximately 500 acres at



The drop spillway in the floodwater retarding dam of Shakopee Lake.

flood stage.

The water control structure at the outlet of each lake consists of an earth-fill dam and a concrete drop spillway. They contain neither gates nor valves. These control structures maintain a stable pool level in the lakes throughout the summer. The water rises only during periods of heavy runoff from heavy rains in the watershed.

In the fall of 1958, there was less than five acres of water in Shakopee Lake. The control structure, completed just before freeze-up that winter, maintained a constant water level in the lake throughout 1959 and 1960. Even with less rainfall in 1959 than in 1958, there was 300 acres of surface water in the lake that fall.

There is a small local hatch of ducks, mostly teal, in both Swan

and Shakopee Lakes. The chief advantage of the lakes to waterfowl is a stopover or resting area during the spring and fall migrations. In the falls of 1955, 1956, and 1957 there were up to 5,000 mallards feeding out of Shakopee Lake during the migrations. Needless to say, duck hunting was "tops" in the lake and the surrounding cornfields.

In 1958, due to the drought, there was only five acres of water left in the lake and this was used only by a few Great Blue Herons and Wilson Snipe.

In 1959 the big northern mallards returned. Again thousands of them used Shakopee Lake as a stopover during their southern migration. The 300 acres of shallow water provide just the spot for the ducks to use as headquarters between their daily trips to the neighboring cornfields. They remain here until the lake freezes, then take off for the south. Escape cover and nesting areas plus winter protection are provided for pheasants all along the shoreline of the lake. This makes the area ideal for the permanent production of pheasants and other wildlife.

Wildlife enthusiasts and sportsmen are happy with the new Shakopee Lake. The farmers in the watershed benefit from the controlled water and managed soil. The people in the cities downstream on the Chippewa River know that their flood problem has been greatly decreased.

Fish For Food

An international conference on fish in nutrition will be held in Washington, D. C., September 19-27, 1961, under the auspices of the Food and Agriculture Organization of the United Nations. About 400 representatives from 50 nations are expected to attend. Fundamentally, the conference will assemble scattered information on the nutritive value of fish, assess it, and stimulate future scientific investigation of this food source.



Shakopee Lake, in the background, with floodwater retarding structure and floodway in the foreground.

HYDROLOGIC RELATIONSHIPS ON WATERSHEDS IN OHIO

By Lloyd L. Harrold

HYDROLOGIC studies at the Coshocton, Ohio, Soil and Water Conservation Research Station have revealed general relationships, which have been used by the author in lectures to trainees participating in the training sessions held at the research station.

These principles and relationships are depicted by monthly averages of: (1) precipitation, (2) rainfall amounts at rates greater than 1.0 inch per hour, (3) runoff amounts for a 2-acre watershed and for a 27-square-mile watershed, (4) soil moisture, (5) percolation, (6) consumptive use, (7) flood peaks, and (8) erosion. These average patterns were developed mainly from the Coshocton Station watersheds. The concepts could apply widely to the humid section of the country where climate and geology are similar.

Nature supplies water to this area in the form of rain and snow in a pattern somewhat like that of Curve A of figure 1. Monthly amounts are usually greater in the growing season—an ideal situation for meeting crop demands for water. Lesser amounts are received in the cooler months of the dormant season.

Intensities of rainfall are likewise greater in the summer months as shown by curve B of figure 1. June and July have the greatest amounts of rain falling at rates exceeding 1.0 inch per hour. Along with high rainfall intensities, we find large raindrops with high velocity and energy.

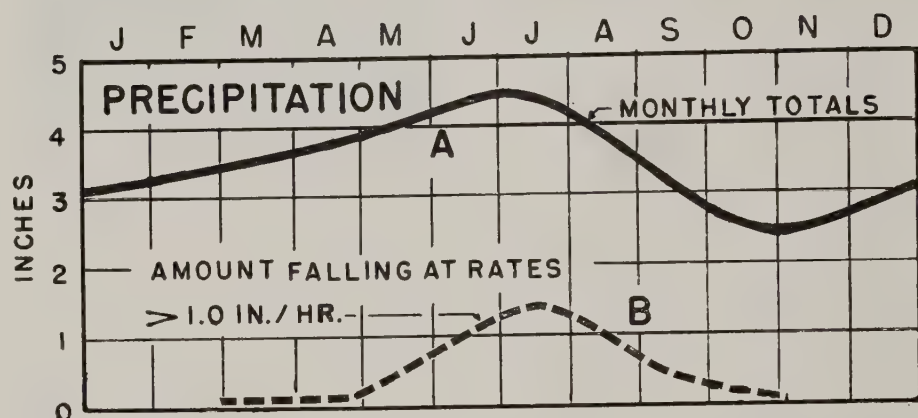


Fig. 1. Average monthly precipitation (curve A), and average monthly precipitation falling at rates greater than 1 inch per hour (curve B) at Coshocton.

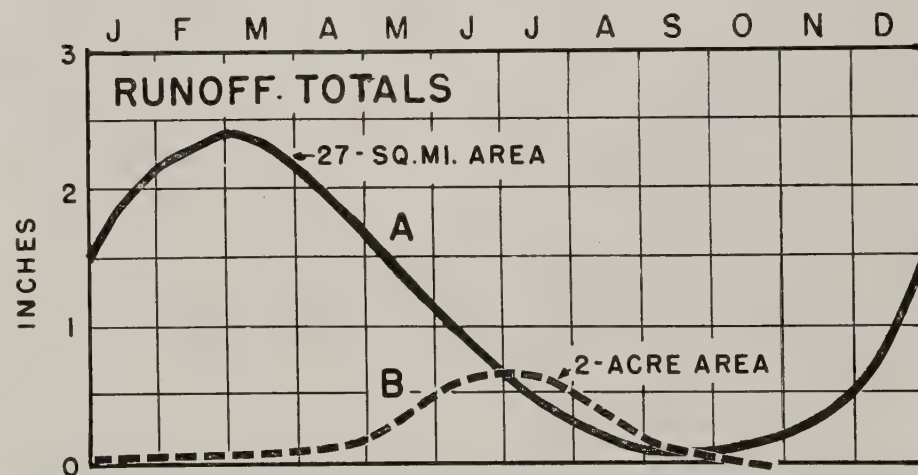


Fig. 2. Average monthly runoff totals from a 27-square mile watershed (curve A) and a 2-acre watershed (curve B) at Coshocton.

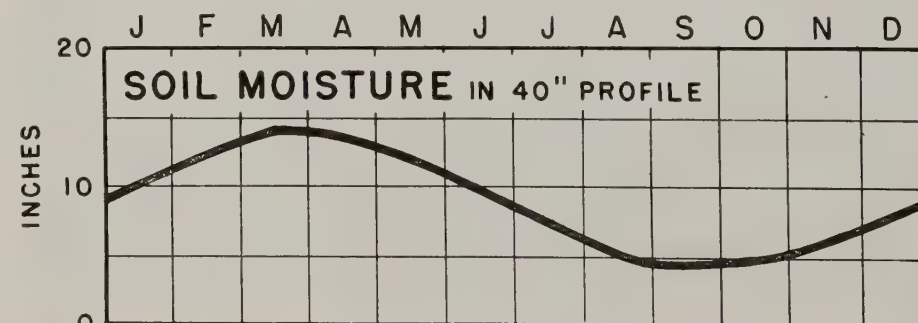


Fig. 3. Average monthly soil moisture in a 40-inch profile at Coshocton.

Note:—The author is supervisory hydraulic engineer, Agricultural Research Service, Coshocton, Ohio.

The average pattern of runoff from a 27-square-mile watershed (figure 2) does not follow closely the pattern of rainfall. Runoff volumes for this watershed, typical of those of 10 square miles and larger, are greatest in late winter and early spring. They are low for the summer and fall months. The precipitation pattern and the runoff pattern for this size watershed differ widely. Additional factors such as soil moisture and percolation, as discussed later, will help explain the reasons for this difference.

The average runoff pattern for a 2-acre watershed (figure 2B) reflects the pattern of rainfall, with relatively large amounts in the summer season and small amounts throughout the remainder of the year. This pattern is quite similar to that of amounts of rain falling at rates greater than 1.0 inch per hour (figure 1B).

Soil moisture in a 40-inch profile (figure 3) is generally high in March and April and low during September, October, and November. The period of depletion, May-September, coincides with the period of high rainfall; and the period of accretion, November-February, corresponds with the period of low rainfall. The consumptive-use pattern of figure 4 explains these apparent differences.

Consumptive use of water by vegetation, sometimes referred to as evapotranspiration, is shown in figure 4. Its pattern is high water use in the warm growing season and low use during the remainder of the year. It causes soil moisture depletion during the months of high water delivery. Low water use in October, November, and December allows the soil moisture to increase even though rainfall is in lesser amounts. Also, soil moisture evaporation follows closely the consumptive-use pattern.

The percolation of water into the rock beneath the root zone can be

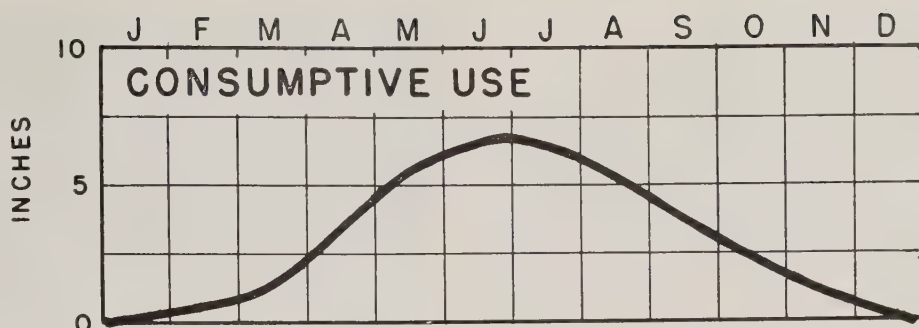


Fig. 4. Average monthly consumptive use of water by vegetation at Coshocton.

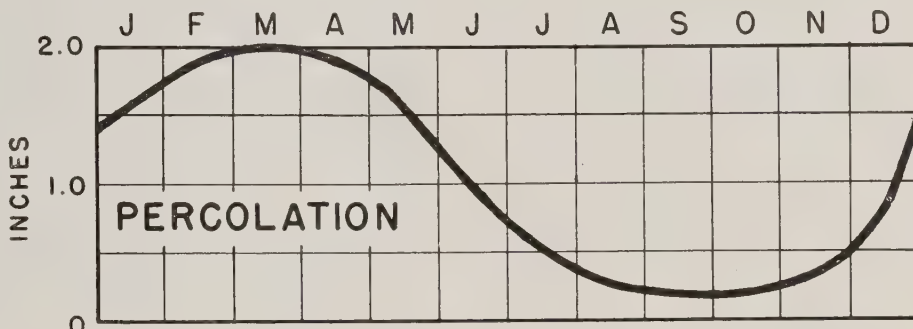


Fig. 5. Average monthly percolation of soil moisture into soil and rock formations beneath the plant root zone at Coshocton.

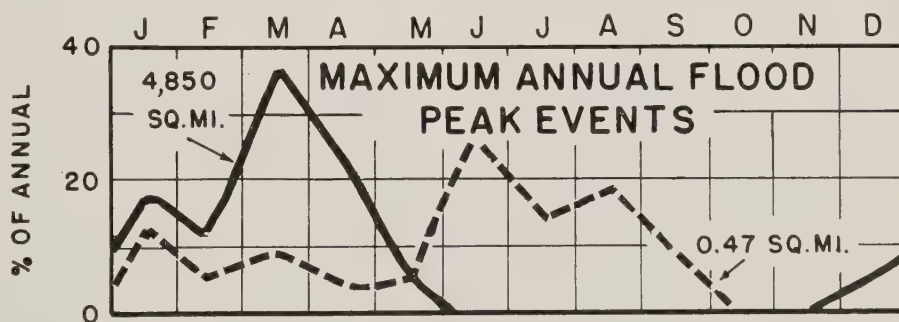


Fig. 6. The pattern of flood peaks on a 4,850-square-mile watershed and a .47-square-mile watershed near Coshocton.

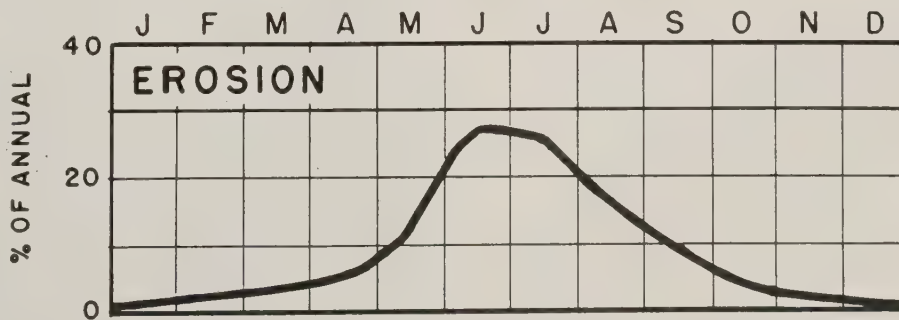


Fig. 7. The monthly soil erosion average at Coshocton, expressed in percent of the average annual erosion.

No. 61

This is the sixty-first of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

considered as recharge to aquifers. It is measured at the 8-foot depth of the Coshocton lysimeters. Percolation (figure 5) is greatest during the January-May period. About 85 percent of the annual total occurs during this period. It is natural to find the percolation pattern corresponding to that of soil moisture. In the Coshocton area, aquifer flow reaches surface streams that lie at elevations below that of the aquifers. The flow in the stream of the 27-square-mile watershed (figure 2A) includes much aquifer flow. When the soil moisture was high, the aquifer recharge was great and its contribution to stream flow was quite sizable (figure 2A). High soil moisture in March and April also helped cause some surface runoff from rainfall as shown in figure 2B.

The pattern of flood peaks varies from small to large watersheds, as shown in figure 6. Peak flows on large areas coincide with high soil moisture and large percolation amounts. They result from storms of relatively low intensity, covering large areas, and lasting for several days. Rates of flows from small watersheds at that time are relatively low, but in a large-area storm the number of small-area contributions build into a flood.

Maximum flood peaks on small areas are confined mostly to the growing season (figure 6). They result from large amounts of rain falling at high rates. These storms do not usually cause large-watershed floods because they cover only small areas and their duration is short.

Finally, the erosion from fallow

ground (figure 7) is highest in the growing season at the time of maximum flood peaks on small areas, coincident with high-intensity rainfall. Soil moisture in the root zone at this season is generally not high, except for relatively short periods following heavy rains.

The above concepts are generalized. Yet they depict the fundamental relationships of hydrologic factors involved in water management on agricultural land. Based on these concepts, the job ahead for the soil and water conservationist becomes clear. The season of high rainfall coincides with the season of ground tillage to produce the season of greatest erosion. At this

time, rainfall occurs at high rates and in large drops. The land surface must be protected against erosion and the sealing of its pores. The relatively low moisture content of the soil during this season denotes available pore space. The conservationist should strive to have more of this soil pore space used to absorb summer storm rainfall. This would help reduce upland floods and provide more moisture for stabilization of spring flow.

Similar concepts can be developed for other climatic and physiographic regions. More precise values within each region can be developed from actual measurements.

Taming the Pit River

By Arnold E. Bullock

FLOODING is a serious problem on the Pit River, in the northeast corner of California. It is a swift-flowing mountain stream until it reaches the almost level area of the Canby Soil Conservation District in Warm Springs Valley. Here, the rate of flow slows to a crawl.

Note:—The author is work unit conservationist, Soil Conservation Service, Alturas, Calif.

The meandering river forms many oxbows and ponds. Flooding occurs every few years, aggravated by restrictive irrigation dams and bridges. Overflow water often forms secondary channels. In some years, large areas are too wet for high-quality hay and small grains, yet this is some of the most valuable land in the Valley.

Interest in eliminating seasonal



The new channel for the Pit River as it crosses the Norman Quigley ranch.



Aerial view of the Pit River as it crosses the Rouse and Quigley ranches. The light line shows the straightened channel; the darker lines indicate former channels and floodplain.

flooding and achieving better control of irrigation water provided the greatest stimulus for the formation of the Canby Soil Conservation District.

Will Rouse, a rancher in the district, decided that he wanted something better than broadleaf sedges and willows growing on his best land. He discussed this with his downstream neighbor, Norman Quigley, who was concerned with the same problem. Rouse had some large earthmoving equipment, so they decided to do whatever was necessary to gain control of the river.

They applied for ACP cost sharing under a pooling agreement and were referred to the Soil Conservation Service for engineering assistance. SCS engineers collected all available flow data from measurements taken by the California State Division of Water Resources and made the necessary surveys to design a channel and levees that would contain the Pit River during

periods of peak runoff.

Although the new channel follows the general course of the old river bed, and utilizes the old channel to the greatest practical extent, considerable construction work was required to eliminate the many sharp turns and oxbows.

A typical cross section of the new channel is 71 feet wide at the top, 50 feet wide at the bottom, 7 feet deep, and has 1½-to-1 side slopes. The channel has been designed to carry 1,525 cubic feet per second. When the 3-foot-high levees have been completed along the new channel, the peak capacity will be approximately 3,000 c.f.s. Each levee will be constructed so that the inside toe is 20 feet from the top of the channel bank.

To date approximately 5½ miles of the river channel have been realigned and improved. This will benefit approximately 1,300 acres of irrigated hay land. The work was done at a total cost of about \$63,000, or \$18 an acre. About

\$17,000 of the cost was borne by the Federal Government through ACP cost sharing.

Although the average frost-free season of 77 days precludes the production of cash crops on any large scale, the production of an adequate supply of hay and late summer pasture is highly important to the range livestock industry in Modoc County. The ranchers feel that comparatively high costs per acre are well justified.

Several of the ranchers in the Canby district are interested in improving the remaining 20 miles of channel as well as some of the smaller tributary channels, which would benefit about 5,400 acres of irrigable land.

The Canby district directors are currently exploring all possible sources for financing further channel improvement, construction of new and adequate diversion dams, and other water control measures of great and lasting benefit to this community.



The U.S. Senate Committee on National Water Resources has reported that there are about 10 million cattle and calves and 6½ million sheep on irrigated farmlands at the beginning of each year. About one-third of these animals are raised entirely on irrigated farms. The 3 billion pounds of beef and veal, plus 500 million pounds of lamb and mutton, produced on irrigated lands are an average of 20 pounds of meat per person.



In the Southern Great Plains, rock formations yield large quantities of ground water to wells. At present, these formations hold great quantities of water. But only about .2 inch of the annual precipitation reaches the ground-water supply. In 1935, annual withdrawals by pumping were about equal to the recharge rate—50,000 acre-feet. In 1958 the withdrawal was 7 million acre-feet.

The Ladies Help Steer

By Herbert I. Jones

WHEN watershed protection and flood prevention become a reality in the Gering Valley of Nebraska, residents there will owe special thanks to a group of 20 women who were members of the steering committee, working for orderly watershed development in the community.

Not that the men haven't worked on the watershed problem for a good many years, too. But when the chips were down, it was the wives who delivered 1,023 signatures on the petition to set up a watershed organization. And they did it in less than a week!

This was not a curiosity sign-up, either. It was the real thing. The name of a property owner on the petition meant a probable tax obligation of up to two mills to sup-

port the organization under Nebraska law.

The women's participation grew from necessity. Their husbands could spend little time away from the fields in the rich valley where they reap a living from potatoes, sugar beets, alfalfa, and grain. Though they cast anxious eyes at thunderheads and worried about the possibility of floods, they dared not leave their irrigation to work for watershed organization. Occasionally, they did steal away at night for a get-together, but then only briefly.

At a meeting conducted by the Scotts Bluff Soil and Water Conservation District last spring, they learned that the time for scheduling watershed planning was near. If they expected to be included in that year's flood prevention work, they needed to get busy.

Note:—The author is information specialist, Soil Conservation Service, Denver, Colo.



The Gering Drain started, years ago, as a couple of plow furrows; but toward its lower end, in the heart of the best irrigated land, it is now a large gully that continues to devour good farmland.



Mrs. Arthur Weinhold (left) and Mrs. Ray McKeeman, the first women members of the steering committee for the Gering Valley watershed project.

That's when district supervisor Arthur Weinhold suggested adding ladies to the steering committee—and volunteered his wife!

Mrs. Weinhold knows the Gering watershed and what floods mean. And so do Mrs. Albert Hengelfeldt and Mrs. Ray McKeeman, who were the first to agree to help.

They have watched runoff sweep down the slopes near historic Scotts Bluff and across dryland fields, pastures, and irrigated farms to the city on the banks of the North Platte River. It happens every year, sometimes more than once.

In the series of floods in May and June 1955, damage to irrigation systems, drains, roads, and bridges ran near \$100,000. Land and crops suffered another \$50,000 damage. One authority reported that even this total was dwarfed by the serious bank and channel erosion whittling off huge chunks of \$500-an-acre cropland.

Pioneer watershed efforts concentrated the flows that spread



Farmer P. A. Scarlett signs the petition for a Gering Watershed Association presented by Mrs. Ray McKeeman (left) and Mrs. Albert Hengelfeldt.

across the flat valley in a channel known as the Gering Drain. At one time it was just a couple of plow furrows. Now it's a sand-scoured land hog with numerous treacherous tributaries.

After a quick meeting to double-check their plans, Mrs. Weinhold, Mrs. Hengelfeldt, and Mrs. McKeeman set out to organize the wives in the valley.

About 25 women answered their call to meet at the Community Club. There they listened as Mrs. Weinhold explained the gravity of petitioning. A school census map was spread out and the ladies subdivided the valley. Then they assigned the areas for which each would be responsible.

Next day they were out in force, systematically covering the 33,000 irrigated and 27,000 dryland acres that comprise the Gering watershed area.

Forty-eight hours after they took on the job the women had 90 percent of the farmers and ranchers on the dotted line. Then they regrouped before canvassing the homes in Gering. Long after they had enough signers, they kept on. Though they made repeated calls at some homes, they never did actually see all 1,200 eligible voters.

But they came mighty close.

Caught by this enthusiasm, the steering committee took the petition to the Capitol in Lincoln and outlined the project to the State Conservation Board. The board gave it high priority on their schedule, and the application received approval by the SCS in August 1960.

A Soil Conservation Service watershed planning party was on

the job by September, and work plans for the project were completed early in 1961. The Gering Valley folks are now anxiously awaiting the start of structural works along the drain and its tributaries. In the meantime, farmers of the valley are working toward improvement of their conservation farming and irrigation practices, so essential to the success of the project.

Fertilizing Flood Prevention Structures

By James Guillory

VEGETATING floodwater-retarding dams, spillways, and disturbed areas is going modern in Louisiana.

The distribution of fertilizer was an expensive and time-consuming item until an airplane was employed. Use of the airplane saved nearly half the costs, cut the time from six days to less than one day, and secured more even distribution.

In two jobs on Bear Creek watershed, the first required 31 tractor-

hours with driver and spreading equipment, plus 190 man-hours for laborers to distribute fertilizer on the steep slopes by hand. Total cost for 25 acres was \$444.25 or \$17.77 per acre.

It took an airplane six hours to distribute the fertilizer on 35 acres. Total cost was \$339.50, or \$9.70 per acre.

One thousand pounds per acre was used on each job.

The savings in headaches and the time of SCS and district personnel was at least equal to the savings in money.

Note:—The author is work unit conservationist, Soil Conservation Service, Oberlin, La.



Airplane spreading fertilizer on floodwater retarding structure in Bear Creek watershed.

Saving and Using the Runoff

By Donald N. Davison and Verl G. King

WENDELL WELLING, who farms in Idaho's Bear Lake SCD, had water problems. Excess water from winter runoff, water from springs, and drainage water from wet meadows plagued him during the spring and early summer, while lack of water for proper irrigation was a problem during late summer. He is now collecting this spring runoff and putting it to good use.

Welling has for years watched water from two springs near the center of his ranch flow across his land and into the Bear River at his farm boundary. Appreciating the value of such a resource, he began to explore means of developing this stream for beneficial use. The building of two dams to store the water during the winter for use

during the irrigation season was the result of his exploration.

With technical assistance from the Soil Conservation Service, Welling completed his plans in 1959 and completed the dams by August 1960. Cost-sharing assistance was furnished through the ACP Program by the County ASC Committee.

The dams were built at locations where the maximum winter runoff, spring flow water, and any water obtainable from drainage could be collected.

The larger dam was started in the fall of 1959 and completed in the spring of 1960. Winter runoff and water from a spring above the dam filled the reservoir by March 1960. The dam is 420 feet long and 28 feet high. It holds approximately 133 acre-feet of water and backs water over 13 acres.

The smaller dam was constructed



Water flowing from the outlet structure of the large dam on the Wendell Welling farm.

during the summer of 1960. This dam also collects winter runoff and water from several springs. The reservoir is designed to hold about 9 acre-feet when full.

A tile drain approximately 1,000 feet long was installed above the smaller dam in a wet meadow. The upper end of the tile line also collects water from several springs. A structure was built at the outlet end of the drain to direct the spring water through a line to the large reservoir or deliver it directly into the smaller reservoir. Reservoir heights are at the same elevation and the top one foot of water can be interchanged without pumping.

Welling installed a gasoline-powered pump, mainline, and sprinkler system at the large dam last summer, and used it successfully. He plans to use a similar system at the smaller dam.

A natural gas line runs through the farm close to the two dams and the operator plans to convert his motors to natural gas power for greater economy.

Note:—The authors are, respectively, work unit conservationist, Montpelier, Idaho, and engineer, Preston, Idaho, both of the Soil Conservation Service.



Wendell Welling at the trickle-tube spillway in the larger dam on his farm.

Welling and SCS technicians calculate that the combined water from both dams should irrigate adequately about 450 acres. The entire farm consists of 1,862 acres, of which 62 acres are hilly and rocky and considered nonfarmable. The nonirrigated farmland will have a winter wheat-fallow-alfalfa grass rotation. Sweetclover will be seeded with every third grain crop as a green manure.

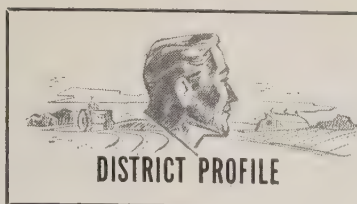
Welling is so pleased with the results of his investment that he is already planning more drainage installations to add water to his supply. He is also considering a large feedlot for his farm which would furnish a ready market for his grain, hay, and straw, and also supply needed barnyard manure for his cropland.

Due to the short growing season (approximately 95 days) in the Bear Lake area, it is difficult to grow crops other than small grains, hay, or pasture. Welling plans to experiment with seed potatoes on a small acreage which, if successful, would provide an alternate crop for his irrigated acreage.

When asked whether he felt that his investment in the dam would pay dividends, Welling's answer was an emphatic "yes." Being aware of the increasing demand for water, and the shrinking farmlands of the United States, his answer was typical of those farmers who are looking to the future—who are taking every opportunity to develop their natural resources in preparation for the demands which will be made upon the American farmer in the future.

◆

Don't apply lime just because someone says it's a good idea, or because your neighbor got excellent results from liming. On the other hand, don't wait to apply lime because your neighbor didn't get any response. His soils may not have needed lime.



Hans L. van Leer of Massachusetts

WATERSHEDS and urbanization are keeping Hans L. van Leer on the run. Meetings, talks, and conferences take him to all parts of the country. And watersheds and urbanization are only part of the coordinated soil and water conservation program in which he is actively interested.

As a director of the National Association of Soil Conservation Districts, a director and past president of the Massachusetts Association of Soil Conservation District Supervisors, and chairman of the Middlesex Soil Conservation District board, van Leer has been a key figure in developing important policies on a number of conservation problems facing the Nation and his State. He helped prepare Massachusetts legislation that authorized State financial aid in paying for easements and rights-of-way in watershed projects.

"I'm in favor of local participation and financial responsibility, but in the congested Northeast we have special watershed problems," he said. "The Suasco watershed is an example. That's the most important conservation job facing the Middlesex and Northeast Worcester County Soil Conservation Districts. There are 31 towns in the watershed and Massachusetts law does not permit one town to appropriate money for work to be done in another town. So we needed State money to get the project going.

"The pressure on land is increasing so fast that we have to hurry. The cost of land in the Baiting Brook watershed has doubled in the last three years. That gives you an idea of what we're up against."

To be done properly, watershed

work takes so much time that van Leer believes that the districts need an executive secretary. Such an employee would spend most of his time working with town and State officials. That kind of work is beyond the normal duties of a district supervisor, he feels. Likewise, he sees the need of a State employee who would work exclusively with districts sponsoring watershed projects. That employee could also work with all districts on other matters, such as newsletters, he said.

Van Leer says that urbanization makes up the second largest problem facing his district. And he points out that in many parts of the country, including most of the Northeast, it's the most serious conservation problem.

"In the past 4 or 5 years, requests for district help have come to a larger extent each year from nonfarmers, from urbanites," van Leer emphasized. "Our district has



Hans L. van Leer

OFFICIAL BUSINESS

If your address changes, please notify us of your complete new address, including zone or RFD number, and include old address with our code number as shown above.

adopted the policy of giving help first to farmers and to consider urban requests in the light of the needs of the land. For example, if a city man buys a farm that he doesn't want to operate commercially but wants to conserve the soil and water resources, we provide technical advice."

The National Association of Soil Conservation Districts is doing a good job of keeping the public informed on the urbanization problem, van Leer believes. "But," he adds, "we haven't gone far enough. We need to persuade State planning boards to take our point of view. We need to get associated in an advisory capacity with town and county planning boards."

Van Leer is doing his part. He's a member of the Town of Lincoln appeals board that deals with zoning. He has talked at local, area, and national soil conservation district meetings from coast to coast. At every opportunity he addresses town and city planning boards and groups doing research on urban renewal. He helped to create the Massachusetts Water Resource Commission. In the National Association of Soil Conservation Districts he is chairman of the rural-urban and the information and publications committees.

Despite all these outside activities, van Leer maintains a close watch over his farming operations on Old Sudbury Road, South Lincoln, Mass. —LESTER FOX

8th National Watershed Congress

"Count Down on Water" is the general theme of the 8th National Watershed Congress that meets in Tucson, Ariz., April 17-19, 1961.

The National Watershed Congress was conceived and fostered by more than 20 of the Nation's leading industrial, agricultural, and conservation organizations 8 years ago. It is dedicated to improved management and use of natural resources on a watershed basis. Its yearly meetings afford a forum for the discussion of ways and means of expediting and broadening local watershed programs.

The daily themes for the Congress have been announced as: "Planning for Water Use," "Multiple Use of Watersheds," and "Water for a Thirsty Land." National problems will be discussed mainly during the first two days, while the third day will feature discussions of water problems for Arizona and the Southwest.

World Farm Output Sets Record

The World Agricultural Situation, 1961, a 47-page report by the Foreign Agricultural Service, forecasts world output of farm products in the year ending June 30, 1961, at 42 percent above the 1935-39 level and 2 percent above the previous record set last year.

All major regions of the world except eastern Europe are expected to show increases in farm output this year. The report also points out that the volume of U.S. farm output is about equal to that of Mainland China and almost 60 percent larger than the Soviet Union's. But on a per-capita basis, the statistics show that production in the U. S. is about twice that of the Soviet Union, about four times larger than Mainland China's, but about the same as that of Canada, and only half that of Australia and New Zealand.

Soil Surveys

Soil surveyors of the Soil Conservation Service made field soil maps of more than 50 million acres during fiscal year 1960, an increase of 2 million acres over 1959. Also, 38 soil survey reports and maps were published, and 27 additional reports were prepared and made ready for printing. As of June 30, 658 million acres had been mapped in sufficient detail for soil and water conservation planning on farms and ranches and small watershed projects. This is about 34 percent of the total land area of the U. S. and about 53 percent of the agricultural land in the Nation's 2,861 soil conservation districts.



U.S. farm output in the 1950's rose faster than U.S. population—27 percent compared to 19 percent.

MAY 1961

Soil Conservation





Growth Through Agricultural Progress

"Grass can make beautiful the hillsides, schoolyards, roadsides, farmsteads; in doing so it brings greater utility and efficiency."

—CLINTON P. ANDERSON



COVER PICTURE.—A grass-legume improved pasture in Crawford County, Indiana.

CONTENTS

PAGE	
219	Grass Crops In the Conservation Program <i>By Donald A. Williams</i>
220	Good Grassland Management <i>By Ira Clark</i>
222	Birdsfoot Trefoil Pastures in Iowa <i>By John K. Maddy</i>
224	Land Judging Contests <i>By David O. Davis</i>
226	Four Times the Hay With Half the Water <i>By Lenard Smith</i>
228	Grass Planting With Fewer Failures <i>By C. W. Gantt, Jr., and W. C. Hulburt</i>
230	Path Valley's Green Acres <i>By William Hayes and Henry Warner</i>
231	The Big 40 <i>By H. Obert Anderson and R. K. Lawson</i>
233	Arkansas Farmers Like Sericea Lespedeza <i>By Wilson W. Ferguson</i>
234	Soil Stewardship Week A Community Undertaking <i>By Paul Hutton</i>
235	Tall Fescue—A Winter Grass For Florida <i>By H. E. Van Arsdall and LeeRoy Wiggins</i>
236	Little's Bermuda Pays Big <i>By Bernice DeShong</i>
237	Wheatgrasses Do a Job for Arizona Rancher <i>By Mervin H. Wallace</i>
239	Book Reviews

Soil Conservation

ORVILLE L. FREEMAN
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

TOM DALE, Editor

15 CENTS PER COPY

FOREIGN—\$2.25 PER YEAR

\$1.50 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Grass Crops

In the Soil and Water Conservation Program

By Donald A. Williams

THE grasses and legumes we normally grow as sod-forming crops for forage or soil improvement and protection have played a prominent part in our national soil and water conservation program from its beginning.

Conservation farmers everywhere use sod-forming vegetation to line their waterways, to protect terrace outlets, and to stabilize the channels of diversion and drainage ditches. Contour strips of grasses and legumes are frequently alternated with clean-tilled crops to check erosion on sloping fields. Sod-based rotations are commonly used to improve soil structure and tilth. Year-round cover crops of grasses and legumes are frequently used in orchards and vineyards, while winter cover crops are regularly used on clean-tilled fields in southern climates. And, of course, most conservation farmers turn to the grass crops if they have severely eroded fields that must be retired from cultivation.

Highway engineers now regularly use grasses and legumes to protect bare cuts and fills along newly constructed roads, and to prevent erosion in roadside ditches. And it is standard practice to establish a good sod cover on nearly all earth dams or spillways built for erosion control or flood prevention.

These are just some of the more obvious ways in which we regularly use grass crops in soil and water conservation. But these crops can play an even more important role in our conservation program if we will use them to their full potentialities. They must play a dominant role in our land conversion pro-

gram, and should be an integral part of most conservation cropping systems. If grass crops are to be used much more extensively, however, they must be made to bring economic returns to the farmer comparable to the returns he receives from other uses of the land. Experience has shown that this can be done. Countless examples prove that grass crops, when properly planted and managed, often produce more net income for a farmer than will the cultivated crops customarily grown on the same land.

In this day of excess production of certain basic cultivated crops, we need to apprise farmers of the possible economic advantages of shifting some of their tillable land to grass crops. Nearly 25 million acres of land now used for cultivated crops, in capability classes V to VIII, should be converted to permanent vegetation—much of it would make highly productive grassland. In addition, there are about 45 million acres of class IV land in cultivation; much of this should be converted to permanent grassland. Furthermore, much of our good cropland, classes I to III, should be planted to grass crops more frequently than is commonly done.

But probably the greatest advances conservation farmers can make in the use of grass crops is not in the planting of greater acreages, but in improving present grasslands so they more nearly reach their conservation potentials. The national conservation needs inventory, recently completed, indicates that nearly three-fourths of present grassland needs some type of treatment. Reestablishment

through seeding, fertilization or liming, better management and use, or development of better soil-water relationships is needed before these grasslands approach the desired production. By improving and properly managing these grasslands, the production from them could doubtless be doubled, tripled, or even quadrupled in most instances.

It has long been an established fact that high-quality pasture is one of the cheapest sources of feed for most classes of livestock. Usually it costs about three times as much to produce a pound of digestible nutrients from grain as it does from good pasture. Fortunately, many farmers are becoming aware of the value of good pastures and productive haylands, and are beginning to treat their grasslands with the same care they give to their cultivated fields. More of them should be encouraged to do so.

A grassland program that supplies adequate amounts of good pasturage throughout the grazing season and high-quality hay and silage when needed should be an integral part of every livestock farmer's conservation plan. Furthermore, the proper use of improved grass crops should be an important part of conservation plans, even on many farms devoted primarily to the production of cash crops. These important tools in the soil and water conservation program will be used to their full potentialities only when all conservation farmers and ranchers make definite plans to so use them. Good grasslands don't just happen; they must be planned.

Good Grassland Management

A Family Tradition

By Ira Clark

TOPNOTCH grassland farming has become a family tradition with the three Hubbard brothers—Wesley, Delos, and Robert. Each of these brothers, who live in the Grace-Soda Springs area of Caribou County, Idaho, carries out his grassland operations independently, and all are doing an excellent job.

Wesley lives on the old home place and runs an irrigated farm and a cow-calf feeder operation. Delos has primarily a feeder-calf, feeder-yearling layout. Robert leans strongly toward dry farming and intensive irrigation agriculture, including an irrigated pasture program that is one of the best in southeastern Idaho.

Wesley and his sons, Deon and Verl, have a self-sufficient operation. The only feed they buy is a little molasses, which they find greatly facilitates their feed mix-

ing. Over the past several years, they have acquired range and dry farming holdings at Windmill Flats, considerable holdings in the Meadow Creek Grazing Association, and 1,017 acres of private land on the Chub Flats.

It is the Chub Flat unit to which Wes and his boys presently are giving a lot of attention. In 1953, they acquired a tract of 377 acres that had been reseeded to improved grasses, including crested wheatgrass, intermediate wheatgrass, and smooth brome grass.

"These seedings," Wes relates, "are producing several times the feed grown on adjacent Meadow Creek range. As soon as I started using these improved seedings, I could plainly see I needed to improve my other holdings, and started to do so."

In 1957, he put 248 yearlings on approximately 350 acres of seeded pastures on June 3. On September 20, these animals were moved from

the pasture. At selling time, their average gain was 2.05 pounds a day. This was a yield of about 158 pounds of beef per acre for the seeded range pastures.

"But that isn't the complete picture," Wesley points out. "On September 1, we rounded up 100 head of cows and their calves and put them in the pastures behind the yearlings. We left the cows there until November 1, and there was still worlds of feed when we took them out. That's another 200 cow-months of grazing. I'm convinced those improved range pastures will easily make 250 pounds of beef per acre per year if managed properly."

Wes Hubbard seeded an additional 400 acres to pasture in the spring of 1960.

Delos Hubbard, like his brother Wesley, is a soil conservation district cooperator. His irrigation operations are carried on in cooperation with the Portneuf district and his range operations with the Caribou district.

His operations are quite different from Wesley's. He operates 300 acres of irrigated land and 1,440 acres of range and native meadow. The range unit includes 400 acres of improved range pasture, 100 acres of meadow, and 940 acres of foothill range. Delos buys most of his feeder cattle as weaner calves, winters them at the farm, and then puts them on improved range pastures for about four months, and sells them as grass-fat feeders.

"That 400 acres of seeded pasture is the key to my beef-making enterprise," Delos says. "There's

Note:—The author is range conservationist, Soil Conservation Service, Pocatello, Idaho.



Yearling cattle on improved grass-legume range on the Wesley Hubbard ranch.

where I make my cheap gains. I stock my seeded pastures at about one yearling or a little more per acre for the summer season. Over the past 10 years, I've averaged about 300 pounds of beef per acre each year."

This high production from the reseeded pastures cannot be attributed to any single practice—it's a multiple-practice deal, as Delos points out.

"First," he says, "one has to have a high-producing stand to start with. Second, I use a rotation grazing system so that I get over the four pasture units at least twice each year. By doing this I can keep the feed fresh and the stock gaining right up until frost. And third, I avoid overgrazing. I find production goes down as soon as I overgraze my fields. I like to leave what looks like a stubble height of about six inches."

The reseeded pastures, of which Delos is so justly proud, date back to two seedings—one of 300 acres made in 1951 and the other of about 100 acres made in 1956. The basic seed mixture of each was approximately as follows: Manchar smooth brome, 6 pounds per acre; intermediate wheatgrass, 6 pounds; and Rangar alfalfa, 2 pounds. In the 1951 seeding, however, small amounts of tall oatgrass and alsike clover were added.

A check of the stands in the late summer of 1960 showed that the tall oatgrass had gone out of the 1951 planting, as had most of the intermediate wheatgrass. The alsike clover is still in, as is the intermediate wheatgrass from the 1957 planting. That the alfalfa has persisted through 10 grazing seasons attests to Hubbard's good grazing management.

Robert Hubbard, the third member of the brother trio, follows a still different but equally outstanding grassland program, as a part of his sprinkler-irrigation farming. The conservation program he follows was worked out with the Soil Conservation Service



Feeder calves on a seeded range on the Delos Hubbard ranch.

work unit conservationist at Soda Springs. It provides for an intensive cropping system without soil deterioration. It became apparent as the plan was developed that there had to be a close balance between the cropping and livestock phases of the program if a proper soil-building and high-fertility system was to be maintained. Livestock was needed to utilize the hay and other feed produced in the soil-building program.

To get the program going, Robert seeded 70 acres to pasture in the spring of 1955. He planted the pasture with a light seeding of barley, using a grass-legume mixture of tall fescue, 2 pounds per acre; Manchar smooth brome, 4 pounds; orchardgrass, 4 pounds; and alfalfa, 2 pounds. The pasture seemed slow to start; so he cut the

barley for hay in mid-summer, sprinkled the field throughout the rest of the season, and that fall applied 200 pounds of 33-percent nitrogen fertilizer.

By early spring, the grass looked "pretty good," and Hubbard gave it another boost by applying 200 pounds of 33-percent nitrogen. He then let the pasture grow until the grass had a "real good start."

"I had put a fence through the pasture, cutting the field into two units, and had planned to subdivide each of these units into two," Robert recalls. "But when I turned 75 head of steers in on May 15, it soon became obvious I was not going to need all that pasture. I grazed only one 35-acre unit that year, and cut the other field for hay."

He left the 75 steers on the pas-



Sprinkler-irrigated pasture on the Robert Hubbard farm.

ture for three months, a stocking rate of 2.14 steers per acre.

"I sold at Ogden that year," he says, "and found the steers had made just a shade short of three pounds a head per day. It figures out that the pasture produced about 600 pounds of beef per acre that year.

"In 1957, I grazed the 35-acre pasture with 97 head of yearling heifers. The other 35 acres was plowed out for potatoes. I put 300 pounds of 33-percent nitrogen on the pasture the first thing in the spring and turned the cattle on it on May 1. I decided to try finishing that bunch of heifers on grass to see how it would work out. Within a few days, I started feeding grain. On August 19, I topped out 70 head and sold them; the balance went on September 28. They had made a little more than 2½ pounds



Robert Hubbard in one of his potato fields.

per day while on pasture."

Discussing production for 1957, Robert says: "It's difficult to separate gains made from grass from gains made from grain.

According to my records, however, I think that the pastures made over 700 pounds per acre."

His records show that his returns from the pasture compared favorably with those from wheat, potatoes, or beets, taking into account production costs.

"Pastures," Robert emphasizes, "are just part of my irrigation farming operations. In the spring of 1960, I plowed out about 20 acres of the 35 acres of pasture and planted it to potatoes. That's where it fits into my cropping scheme, and I find if a person plans to follow a soil building plan, he had better use some grass crops in his rotation."

Taken collectively or individually, the three Hubbard brothers, Wesley, Delos, and Robert, seem to know how to handle grass—at least they are doing it and doing it well.

Birdsfoot Trefoil Pastures In Iowa

By John K. Maddy

BIRDSFOOT trefoil pastures are paying big dividends to many Iowa farmers, according to a recent survey made of soil conservation district cooperators who have been using this legume for several years. They report that animal gains have been more than double those obtained from unimproved pastures on similar soil. It has proved to be equally profitable to both sheep and cattle raisers.

The total acreage of Empire birdsfoot trefoil in Iowa had increased to more than 100,000 acres by 1960, with prospects for still further substantial increases in the immediate future. This has been a

remarkable increase, considering the fact that the first known planting in Iowa was made on a field of less than 2 acres in 1938.

Birdsfoot trefoil is a perennial plant similar in appearance to alfalfa, but has a weak stem which does not permit erect growth. It has most of the good qualities of alfalfa; and, more important, stands often improve by natural reseeding. It can withstand much closer or continuous grazing than alfalfa and does not cause bloat.

Best results from trefoil are obtained when all good management practices are used, including controlled grazing and fertilization. It is usually seeded as a companion with other grasses; bluegrass or

orchardgrass have been favored as companion crops. It has not been definitely established how long trefoil stands may persist, but Iowa's first seeding made on the Howell farm near Centerville in April 1938 is still in production. In fact, it is in better condition now than when first seeded. The original 1½-acre seeding on this farm has been increased to 135 acres of improved pasture.

Birdsfoot trefoil usually does not produce as much total forage as alfalfa. But some soil types in Iowa, with heavy subsoils, produce more trefoil than alfalfa. Regardless of forage production, it seems that animal gains made on trefoil are equal to and sometimes exceed

Note:—The author is agronomist, Soil Conservation Service, Des Moines, Iowa.

those produced on alfalfa.

Research by Iowa State University shows that steer gains on unimproved pastures, mostly bluegrass, average from 70 to 130 pounds per acre. The same pastures renovated with trefoil give average gains ranging from 150 to 450 pounds per acre.

According to the research information released, the average annual cost of seeding, fertilizing, and maintaining trefoil pastures for a 10-year period amounted to \$6.50 per acre. The 100 to 200 extra pounds of beef per acre each year is a good dividend for this small investment.

Soil conservation district cooperators interviewed recently say they are finding this "extra dividend" available. Although their returns per acre may not have been figured as scientifically as those on University farms, they are quite enthusiastic about their trefoil pastures. The last few years included a period when growth conditions for trefoil were favorable; and many stated that they had difficulty in utilizing all the forage produced during the early grazing season.

In addition to its use as pasture, trefoil may be used for hay or silage. An interesting report comes from the Jon Bar Ranch located in the Dallas County Soil Conservation District. On this farm, 150 loads of green chopped silage were taken from a 32-acre field. A few loads weighed at harvest time ran a trifle over three tons per load.

This would amount to 14 tons of green material per acre.

Loren Loomis from the Warren SCD stated that the land he now has in trefoil was purchased in 1948 for \$30 per acre. It cost him \$20 an acre to renovate it. The land ranged from Class IV to VII and was producing very little pasture before treatment. In 1960 he ran 20 cows with calves for 4 months and 60 yearlings for 2 months on this 30-acre pasture. The calves and yearlings made a total gain of 11,600 pounds of beef for this period, an average net gain of 387 pounds of beef per acre. In addition, 1 bull, 18 sows, and 130 pigs were run on the pasture during a part of the period.

Arlie Horn from the Davis SCD states that after he learned what his trefoil fields would produce and remembers what his old bluegrass fields produced, he feels terrible about his loss of production in the past. He planned to complete the renovation of his remaining pastures this spring by seeding the last 25 acres of trefoil. He will now have a total of about 100 acres of improved pasture.

Vic Cowles, a cooperator with the Davis district, says he makes more money from his 40 acres of trefoil than he does from any other 40 acres on his farm. This includes some land that occasionally produces over 100 bushels of corn per acre. During the 3 years, 1958-60, he estimates his average gains from steers, during the 5 or 6 months



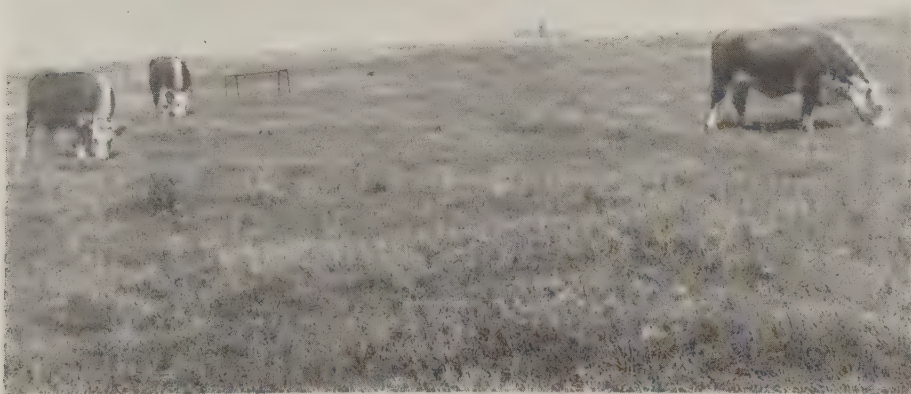
Birdsfoot trefoil on the Jon Bar Ranch that reached nearly 4 feet in length.

they were on this trefoil pasture, ranged from 375 to 630 pounds per acre.

Blake Phelps of the Van Buren SCD pastured 25 cows, 23 calves, 10 yearling steers, and 175 ewes with lambs for 6 months and another 25 cows for 3 months on his 90-acre trefoil pasture. He figured his net gains from the calves, yearlings, and lambs at 358 pounds per acre for the season. In addition, the pasture furnished a maintenance ration for the cows and ewes.

Edgar Reed, of the Polk SCD, pastured 70 ewes and 60 lambs for 5 months on his 20-acre trefoil pasture in 1960. He estimates the gains from the lambs alone at about 300 pounds per acre.

Ed Wise, who has pastured trefoil for many years in the Jasper district, kept records last year on his purchases and sales of yearlings on pasture. Before the results were available he already had agreed to cash-rent the field this year. "If I had known the profits I was going to make with so little effort and investment, I would never have rented it," he stated.



Cattle grazing a birdsfoot trefoil-grass mixture in central Iowa.

A Million Have Tested Their Skills in Land Judging Contests

By David O. Davis

IT is morning in Oklahoma City and a large crowd is on hand. Four serious-faced young men walk toward a hole in a field at the city's outskirts.

It is no golf match. Instead of a bag of golf clubs, each young man carries a clipboard. The hole is about 2 feet wide, 3 feet deep, and 6 feet long.

The young men stare intently into the hole. One drops to his knees for a closer look. Two get down into the hole. Each takes a handful of soil from the mound of earth beside the hole. He squeezes it thoughtfully into a little ball.

Next they look to one side of the field. Then they look at the sign at the edge of the hole.

Not a word is spoken. But pencils flash, and notes soon fill the sheets of paper on the clipboards.

These young men—and other such groups waiting nearby—are competing to see who can most accurately appraise the capability of the land, its best use for agriculture, and the most effective treatment for it. They will test their skill on several fields.

This is the annual International Land Judging Contest, climaxing many local and State qualifying

contests involving thousands of young people.

The competition in Oklahoma's capital city had its beginning a decade ago. The land judging idea possibly started 20 years ago with a simple soil identification contest that a Soil Conservation Service employee, Sam D. Lowe, at Pauls Valley, Okla., held for a few youngsters. Lowe believed that such competition had its greatest value among small local groups.

But the idea was bound to expand. Among those who saw unusual possibilities in land judging were Harley A. Daniel at the Great Plains Experiment Station in Guthrie; Edd Roberts, Extension soil conservationist for Oklahoma; and Wendell Tascher, Extension soil conservationist, Washington, D. C. Later, Loyd M. Adeock, in the Foreign Training Division of the Foreign Agricultural Service, saw the opportunity to introduce land judging to foreign nationals who come to the United States for training in various phases of agriculture.

Also, there were folks like Louis E. Derr, State soil scientist for the SCS in Oklahoma; Dan Diehl, Extension district agent in southwestern Oklahoma; Sandy Saunders, agricultural reporter for Oklahoma City radio and TV station WKY; and Clarence Bunch, range management specialist, and R. E. Chiles, Extension pasture specialist, both with Oklahoma State University. Each made his own contribution to the idea's development.

Lowe's soil conservation district-



FFA members participating in the international land judging contest in 1960.

Note:—The author is field information specialist, Soil Conservation Service, Denver, Colo.

wide competition set a pattern for other districts. Daniel brought groups of teams together to study soils on the experiment station. Roberts spread the idea over Oklahoma, organizing and conducting contests. Tascher saw the national possibilities and promoted interest and action in other States. Adcock was primarily responsible for the development of interest in the contest abroad—to make it an international event.

Saunders sent many a message over the air to stimulate the interest of Oklahoma City people and others over the State and Nation. Derr lent counsel and guidance in working out practical rules and score cards, which have been adopted generally where competition is held.

Bunch and Chiles were instrumental in developing the pasture and range judging contest, now held in conjunction with the land judging. Oklahoma City businessmen and other people have successfully resisted efforts to take the contest elsewhere.

It is a big affair. It has taken on a definite national and international complexion. People of other nations first came to observe; now they compete. The word "International" has been part of the contest title since 1955.

The contestants include teams representing colleges, 4-H Clubs, and FFA chapters, as well as those who compete individually—foreign participants, adult men, and women and girls from the United States. On the first day they go through a "school." This is a series of exhibits, demonstrations, and discussions on the State Fair Grounds. The school gives the contestants a refresher course in the principles of land capability classification, especially as it relates to Oklahoma soils and agriculture. Contestants also review the identification of major vegetative species for the evaluation of range condition.

In this way, the contestants are



Women and girls testing their skill in land judging at Oklahoma City in 1960.

informed about the judging problems, rules, scoring, and other matters that will confront them on the contest fields near the city. Location of the fields is known only to officials before the contest.

The land judging competition takes place the second morning. The teams judge soil depth, texture,

permeability, slope, historical erosion, and internal drainage. They estimate the slope of the land in which the holes are dug. They then give their decisions as to the land capability class, the needed treatment of the soil, and its best use for the future.

That afternoon the pasture and



4-H Club members participating in the 1960 land judging contest near Oklahoma City.

range competition takes place. Those competing in this part of the event identify range and pasture plants, and evaluate at least four areas for range condition.

Awards are presented to winners in a gathering at the State Fair Grounds. The awards—plaques, medals, trophies, and cash—are provided by the co-sponsors, Station WKY-TV and the Oklahoma Chamber of Commerce.

More and more colleges are adopting land and pasture and range judging as an effective way to teach an understanding of soil and its treatment. The number of college contests grows each year. The same is true of high schools—and even grade schools. Many States have judging programs. Participation in some States reaches

10,000 or more people annually.

These contests have become an important annual activity in soil conservation districts throughout the United States. District governing bodies have promoted the contests because, in addition to the conservation principles taught, they are a means of discovering and developing needed future conservation leadership.

Important, too, is the fact that each year more and more urban people enter the competition.

Records indicate that more than a million people have taken part in such judging programs since their beginning. Present estimates show that annual participation has grown to 250,000. Three-fourths of these contestants are young people. There is no record of how many

have engaged in land judging contests in other countries, but since 1955 some 230 people from other nations have entered the Oklahoma City competition, with never fewer than 9 foreign nations represented. In 1960, representatives from 16 countries took part. Because the contest is conducted in English, they compete only against each other.

Growth of the Oklahoma City contest has been steady from the first—about a 25-percent increase each year. There were 675 in the 1960 competition. Twenty-six States were represented. And the Tenth Annual International Land, Pasture, and Range Judging School and Contest, on April 27 and 28, 1961, was expected to be the biggest yet.

Four Times the Hay With Half the Water

By Lenard Smith

GEORGE Schumann of Clover Valley, Nev., has set an enviable example for his rancher neighbors in Elko County when it comes to raising an abundance of good-quality hay on high-altitude native meadows.

He has done so through the same soil and water conservation ranch improvement program that brought him the Junior Chamber of Commerce "Outstanding Young Farmer of the Year" award for Nevada in 1959. It has meant good management and hard work.

Schumann's hay yields have quadrupled, from only a ton or less per acre before he began his conservation program to an average of 4.3 tons per acre—this with

much less irrigation water used and lower harvesting costs. He has converted 270 of his 600 irrigated acres by leveling and establishing improved alfalfa and clover-grass hay during the 14 years he has occupied the ranch.

In developing better hay stands, Schumann first plows out the native sod four or five inches deep with a moldboard plow, turning the sod completely under, and seeds a grain crop. To keep the sod from growing again, by not stirring it up, he uses a light disk in preparing the seedbed for grain. When the sod has deteriorated, Soil Conservation Service technicians working with the Clover Soil Conservation District help Schumann with the leveling plans. The leveling is done by contractors or with equip-



Schumann is justly proud of his improved hay fields.

ment rented from the district.

After allowing the leveling job to settle another year, in the meantime raising another crop of grain, he carefully prepares the seedbed

Note:—The author is soil conservationist, Soil Conservation Service, Wells, Nev.



George Schumann admires purebred bulls knee-deep in improved grass stand.

for the new hay. Fields are planed four or five times; then a home-built drag is used to give the land a final dressing before seeding. This smooth, firm seedbed is one of the most important aspects of the whole program. The seedbed also receives a dressing of 200 to 300 pounds of 16-20-0 fertilizer per acre before seeding.

With leveled fields, this Nevada rancher has found he can irrigate twice the acreage with the same amount of water. Previously, he was irrigating 7 or 8 times for one crop of hay, but now it takes only 3 good irrigations to produce 2 crops of improved hay. He uses the extra water to irrigate more pasture land, to keep the summer forage in balance with the increased winter feed.

The improved hay is much cheaper to harvest, per ton, than the native hay, because of increased per-acre yields. Except in baling and stacking, the costs are fairly well fixed, acrewise. Whereas it costs about \$6 a ton to put up native meadow hay, Schumann can harvest the improved hay for about \$3.75 per ton.

Schumann, who raises and sells purebred bulls, explains that good feed is essential to keeping his

cattle in top shape.

"The cattle eat more improved hay, probably due to the palatability," he says, "but the calves are healthier and will put on about fifty pounds more during the winter than those on native meadow hay."

He is convinced that a good roughage (high-quality alfalfa-grass hay) is better for range bulls than a high concentrate-poor roughage (native meadow hay) ration: "It puts them in better

shape to withstand the rigors of the open range country." By feeding improved hay, he is able to cut the concentrate finishing ration in half. His cattle are becoming well known in the range country of the West.

Schumann's ranch has been in the drought disaster area 3 of the last 10 years. The ranchers in Clover Valley rely on spring snow and water runoff. When the snow-pack is too light, little or no water reaches the ranches. To offset drought hazards, Schumann decided to develop an irrigation well. After the spring snow-water runoff is gone, the well will supply water to keep the improved hay stands growing throughout the season. He also is putting in a pipeline or ditch-lining project. This will bring the water across the long alluvial fan from the mountains to his fields without the usual high seepage losses.

Schumann has been a cooperator-board member of the Clover Soil Conservation District since its formation in 1956, and was its first chairman. He first developed a soil conservation plan while a cooperator in the Ruby district, before its division and formation of the Clover district.



Schumann planing 80-acre field with soil conservation district equipment for irrigating with water from snow-capped peaks beyond.

WANTED: Grass Planting With Fewer Failures and Lower Costs

By C. W. Gantt, Jr., and W. C. Hulburt

MORE reliable methods of establishing vigorous stands of grass are being sought in cooperative research carried on in different parts of the country by the Planting and Fertilizing Equipment and Practices Unit of the Agricultural Research Service.

This Federal-State research was started about 10 years ago because of the high cost of establishing desirable grassland species on pasture and hay lands, with the high rate of failure of stands being one of the principal contributing factors. Soil and water land treatment is among operations affected. As Dr. H. A. MacDonald of Cornell University summarized the situation in a grasslands symposium at the 1956 meeting of the American Association for the Advancement of Science:

Only one-third of the grassland acreage planted each year usually

results in a good stand; one-third is a total loss, and the remainder usually results in such a poor stand that its eventual use as productive grassland is doubtful. His conclusions were based on extensive field surveys.

From the start of this ARS program, it was believed that, with proper machine design and proper methods of placement of seed and fertilizer, good stands of grass and legumes could be established quicker and with fewer failures than farmers were obtaining. The experiments involve precision methods of placement and the positions of seed and fertilizer in the soil with respect to each other. A machine was designed and built especially for this purpose for use in field plots.

Results have shown that in most instances small grains and grasses will come up quicker and grow

faster when fertilizer is placed separately from the seed instead of with the seed, as is done with most of today's grain seeding machines. They also have shown that in most instances legume seed planted in narrow bands, and covered with narrow presswheels, germinates sooner and grows more rapidly than seed broadcast and covered with full-coverage packers.

Many, but not all, of the results have been encouraging. Thus at Athens, Ga., during one season, band placement of *Sericea lespedeza* seed and fertilizer gave higher yields than the one sure method of obtaining a stand of sericea, which was to broadcast the seed and cover it with a sawdust mulch. However, another year, the only plots that came through were those under sawdust mulch.

In Tennessee, band-seeded alfalfa and banded fertilizer treatments were best in the spring, but for fall planting, broadcast fertilizer and seed gave the highest stand counts. In three years' experiments with *Sericea lespedeza* in Alabama, equal stands of sericea were obtained with both band-seeding and broadcast-seeding methods. In Louisiana experiments with oats, ryegrass, and crimson clover, the highest yields were obtained by banding seed and fertilizer, and the lowest from broadcasting.

Although findings of this research have not been conclusive as to a single method's being superior at all times and in all locations,



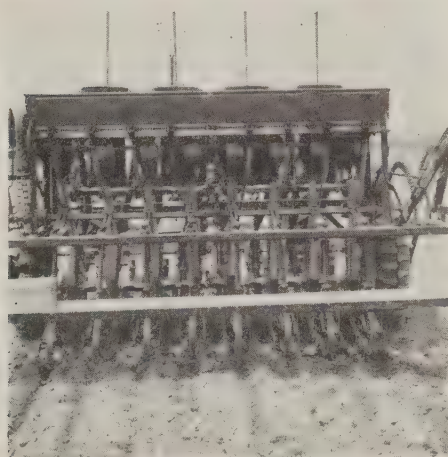
Six weeks' rye growth with fertilizer placed (left) in contact with seed and (right) 1 inch below seed.

Note:—The authors are, respectively, project leader, Southeast Project, Athens, Ga., and head, Planting and Fertilizing Equipment and Practices Investigations, Beltsville, Md., both of the Agricultural Research Service.

the precise placement of seed and fertilizer has been shown to be one of the key methods of insuring good forage stands when they are subjected to adverse planting conditions.

Six special machines are used for this research. They have a wide range of seed planting and fertilizer placement positions, including means of broadcasting both seed and fertilizer, such as: drilled fertilizer in many positions in respect to drilled rows of grass seed (including contact of fertilizer with seed); drilled fertilizer with broadcast seed; broadcast fertilizer with drilled seed; and broadcast fertilizer with broadcast seed. Closely controlled devices for the compaction of soil below and around the seed have been an important part of this study.

A machine of this type for farm use may be developed later by industry, if the experimental data



Precision drill deposits seed by single disk with gage wheel.

prove a machine of new or altered design is needed and justified. Some types of equipment are now available to farmers for drill seeding with fertilizer placement in prepared seedbeds, but they are limited in makes and models. For example, grassland banding attachments for fertilizer grain drills are sold by a number of companies. These kits are good for drilling most legume seeds and small grass seeds that may be mixed with legume seed in the grass seed



Heavy-duty drill for interplanting in sod.

attachment box, such as timothy and birdsfoot trefoil. However, many of the grass seeds like orchardgrass, tall fescues, bromes, and bluestems are not adaptable to this arrangement, except for one recently marketed machine.

Under adverse planting conditions—usually deficient moisture and sometimes extremely low fertility of the soil—two planting methods have produced superior stands, but at some locations have shown the extreme variation from no stand to a full stand: (1) Planting seed in rows, with fertilizer placed in a continuous band about one inch below the seed row; (2) compaction of the soil below and around the seed, with little or no compaction of the area between the seed rows.

Under good growing conditions, these methods seldom show improved stands over the common broadcast and land-rolling method, but the method of drilling seed and precise placement of fertilizer provides good insurance against stand failures if adverse weather conditions prevail after planting. The ultimate aim of the research agricultural engineers and agronomists cooperating in these projects is to

develop practical and economical machines and methods that will insure the farmer of getting a good stand and growth of grassland foliage regardless of such weather and other factors.

Another benefit of precise placement in grassland planting is the extension of planting periods. The quicker growth of the plants by the proximity of adequate plant food now permits planting of slow-growing grasses and legumes up to a month later in the spring, as these new plantings have been found quite capable in most instances of competing with weeds that sprout in warm weather. Likewise, planting of the grasses and legumes may be as much as a month later in the fall, as the usual vigor-

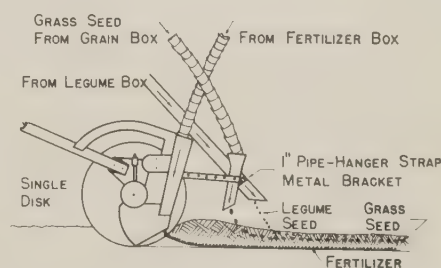


Diagram of band-seeding attachment for fertilizer grain drills.

ous early growth enables the young plants to withstand adverse winter weather.

All these experiments have been on prepared seedbeds, with the fields subject to soil erosion until the grass establishes a good cover. In the interest of soil conservation, research also is being done on placement of the fertilizer and new seed in existing sod. Several machines for interplanting winter grains in pasture and hayland sods have appeared on the market the past 10 years, and are known by such names as pasture renovators or grassland drills.

Sod interplanting drills differ principally from grain drills in two respects: The frame is heavier and working parts are built stronger for tearing through the old sod; and large notched colters are used to cut sod for depositing the fertilizer and seed, with a narrow shovel that disturbs the soil very little.

Use of sod interplanting drills generally extends the number of annual pasture days. Their greatest use has been in the southern part of the country, where winter grains are grown in pastures which are predominately summer grasses such as bermudagrass and bahiagrass. Except for seeding crimson clover in bermuda sod, grasslands to be interplanted need to have a desirable balance of legumes and grasses. There also must be taken into account such factors as competition to the new plant from the existing sod, inadequate moisture at seedling time, and cost of the equipment and its operation.

No. 62

This is the sixty-second of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

Path Valley's Green Acres

By William Hayes and Henry Warner

GRASSLAND farming has brought new life to farmers, sportsmen, and businessmen of Path Valley in Franklin County, Pennsylvania. Twenty years ago, scrubby growth and erosion scars marked the valley landscape. Today, it's a shining example of a valley that came back through conservation. Grassland farming made the difference.

A local banker and farmer, Robert Crouse, sums up the community-wide benefits resulting from the change this way: "Grassland farming has saved our agricultural community. Increased grassland acreage, better varieties of grasses and legumes, and application of conservation practices have tripled the livestock-carrying capacity of the farms in the valley."

"Our banking business is farm business," Crouse says. "Our livelihood in Path Valley is dependent upon the soil. The quality of the

soil and the economic stability of the farm income are of primary interest to the country banker. I always encourage my customers to develop a farm conservation plan for their land."

Crouse has watched many of the farms of this 35-mile-long, 2-mile-wide valley turn into a "green paradise."

A representative Path Valley dairy farmer, Albert Neusbaum, recalls: "There was nothing but weeds and briars on the farm when I bought it 18 years ago. The farm supported only 5 cows, 8 sheep, and 2 horses. Since developing a farm conservation plan in 1942, I have increased the livestock to 32 head of dairy cattle and have been able to sell hay every year."

Mr. Neusbaum's farming program, like the programs of other farmers in the valley, is centered

Note:—The authors are, respectively, agronomist, Harrisburg, Pa., and work unit conservationist, Chambersburg, Pa., both of the Soil Conservation Service.



Path Valley.



Robert Crouse (right)—farmer, banker, district director—discusses conservation farm plan with Henry Warner of the SCS.

around mixtures of alfalfa and brome grass and orchardgrass on hilly land, and bluegrass in the lowland, for permanent pasture. One of the keys to higher production has been a shift in the rotation from corn, wheat, wheat, and hay to corn, oats, and four to six years of alfalfa-grass hay and pasture.

All cropland and hayland on the farm is stripcropped, and Neusbaum has built more than 7,000 feet of diversion terraces.

Bluegrass in the bottom usually supplies most of the May and June pasture. First-cutting alfalfa is put in a trench silo or is "green chopped" to supplement the bluegrass. Later alfalfa cuttings are either aftermath-grazed, "green chopped," or made into hay and silage for winter feeding.

Seedlings usually are established in oats with heavy applications of fertilizer. Before seeding, Neusbaum drills deeply 400 lbs. of 0-20-20, and at seeding time applies 300 lbs. of 5-10-10 in a band. Hay and pasture fields are topdressed annually with heavy applications of manure or 400 lbs. of 0-20-20 fertilizer. Lime is applied to maintain a pH of 6.5 to 7.0.

Neusbaum says: "When we bought the farm, we didn't have a thing we could call our own. My wife and I were in debt on stock and equipment, and I feel sure we could not have met the challenge

had it not been for the Franklin Soil Conservation District and the Soil Conservation Service. Most of us in Path Valley feel this way."

The good results in Path Valley are spreading to the rest of Franklin County. Over the past 25 years, census figures show a 26-percent reduction in grassland acreage in the State, but a 13-percent increase in the county. Alfalfa acreage increased by 312 percent in the State, but there was an increase of 407 percent in the county. Permanent pasture increased 11 percent in the State, while it increased 66 percent in the county.

As the Path Valley landscape has changed, so has the fishing. Conocheague Creek, which drains the valley, has become a trout stream again. In 1945, the Pennsylvania Fish Commission tested the water and found it unfit for trout. A similar test in 1950 re-

vealed improvement, but the water still did not pass the test. The test was rerun in 1954, and Conocheague Creek passed.

The West Branch of the Conocheague has been stocked with trout every year since 1955. Trout are doing well in the stream. A representative of the Commission has pointed out that the increase in grassland acreage and other conservation practices have decreased runoff and increased infiltration and water storage by which streamflow and a proper water temperature for trout are being maintained.

It is easy to measure the results of grassland farming in Path Valley. To the farmer, it has meant more cows and increased income; to the fisherman, trout; and to the businessman, more trade. Yes, grassland farming has brought new life to the Valley.

The Big 40

By H. Obert Anderson and R. K. Lawson

FOR years, Jim Wilson had planned on buying a small piece of land. But unexpected things kept coming up, and it was not until 1950 that Jim finally bought a 40-acre farm east of Omaha, Ill. The buildings were solid but not much to look at, needing a few boards here and there and all needing paint. The old hay barn was small, 30 by 50 feet. The land needed soil conservation treatment to make it an economic family unit.

With help of the Gallatin County Soil Conservation District and Soil Conservation Service technicians, Wilson developed a conservation farm plan for his 40 acres. The first corn crop averaged 25 bushels per acre. Four years later, after

needed soil treatments were made and a crop of legumes and grass plowed down, the corn on a 5-acre 4-H test plot made 142.7 bushels an acre. In 1956, a dry year, the corn averaged 129 bushels per acre and the 5-acre test plot produced 136 bushels to the acre.

With corn yields up to well over 100 bushels an acre, Jim Wilson began to figure up income and expenses. He decided that sales from the four-year rotation of corn, soybeans, oats, and legumes and grass were not paying for the wear and tear and replacement of machinery necessary to harvest these crops.

At this time, with the assistance

Note:—The authors are, respectively, work unit conservationist, Ridgway, Ill., and agronomist, Urbana, Ill., both of the Soil Conservation Service.



Elevator screenings of corn and soybeans that are used as supplemental feed on the Wilson farm.

of SCS technicians, Wilson revised his conservation plan and started a grassland program with livestock on the 40 acres. Six pasture fields were planned. The soils on all fields were re-tested, and minerals were applied to soil-test requirements. The pastures were seeded in March with a mixture of tall fescue, timothy, lespedeza, and ladino clover, with one bushel of oats per acre as a nurse crop. The oats were clipped before heading and the aftermath left on the new seeding. The grasses and legumes were clipped again in August for weed control.

Wilson has an arrangement with a local elevator to remove cob ash and elevator screenings of corn and soybeans, which he gets free of charge except for his labor and hauling expense. He applies the corn cob ash to his pastures at the rate of 1,700 pounds per acre. He figures this is equivalent to an 0-2-25 fertilizer in fertility value. The screenings are stored in an old machine shed and stake-fence-type silos covered with plastic. The screenings contain everything from weed seed to whole beans and corn, but on the average are a cheap source of protein supplement. He feeds one pound of this material per head per day except in dry weather, when the rate is increased to two pounds.

Under his new program, Wilson feeds out 175 head of cattle every year. He usually buys the feeders

in the fall, tries to put 400 pounds of gain on each animal, and sells them by late July or early August. This schedule gives the fescue and ladino pastures a month's rest before a new bunch of feeders are bought and turned onto them.

In 1960, 175 head of feeders were turned onto 10 acres of fescue in February and sold in August. The cattle averaged 500 pounds when turned in and were sold off at 850 pounds, an average of 350 pounds gain per animal.

Jim has records to show that daily gain from $1\frac{1}{2}$ to 3 pounds per animal is possible on good fescue-ladino pasture.

Wilson applies about 12 tons of manure per acre to his pastures every third year, in addition to droppings left by the cattle while grazing. The cattle are moved to a new pasture every three or four weeks, depending on pasture growth. Each pasture is mowed and the droppings scattered after the cattle are taken off. The cattle are fed mostly hay during the winter months, as a supplement to pasture feeding.

Mr. Wilson also started swine feeding three years ago. He must buy all of the feed for the hogs except that provided by pasture. He now carries 75 sows on 15 acres of ladino, fescue, and bluegrass pasture. Litters are weaned at six



Jim Wilson and SCS technician John Daily on a 10-acre fescue-ladino pasture with feeding shed in background.

weeks, and sows are bred to produce two litters a year. An old hay barn is used for a farrowing house, accommodating 20 farrowing crates, but he plans to build a new farrowing building. The sows and litters are rotated on the three pastures the year around. Feeder pigs are fed out to market on ladino pasture. Jim says, however, that "Cattle have one big advantage over hogs—they will give you a market for large amounts of roughage such as fescue-ladino pasture, silage, and hay."

Most soil conservation districts have a number of 40-acre farms. It isn't always possible to make livestock farmers out of grain farmers; but often when the net returns are studied, the intensive use of small acreages by livestock is seen to make a more economic enterprise.

Shred Cornstalks To Cut Erosion Losses

Shredding cornstalks immediately after harvesting will cut soil erosion losses in half on weed-free cornfields, report USDA scientists at Lafayette, Ind. In studies conducted in 1958 and 1959, total soil losses from a control plot amounted to $1\frac{1}{4}$ tons per acre, while losses on a plot which had been gone over with a flail-type shredder were only $\frac{1}{2}$ ton.

When the shredded cornstalks were disked, however, erosion losses rose to 1 ton per acre. Disking usually loosens and exposes much of the soil which otherwise would be protected by the shredded stalks. For this reason, disking of shredded cornstalks is undesirable unless necessary to prevent stalk blowing.

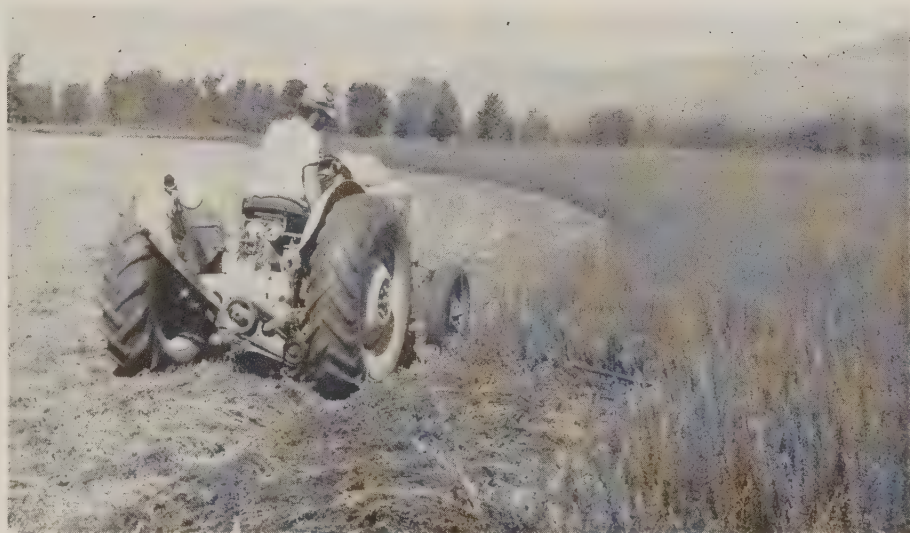
Since as much as 25 percent of the average annual erosion potential occurs during the corn residue period in some areas, shredding cornstalks can significantly reduce soil losses on fields not protected by other mulches, the researchers point out.

Arkansas Farmers Like Sericea Lespedeza

By Wilson W. Ferguson

CONSERVATION farmers in western Arkansas have found *Sericea lespedeza* a dependable plant to grow for hay, pasture, and for erosion control.

They like sericea because it produces hay and grazing every year. Even during the frequent drought periods that occur in this area, sericea remains green and produces forage when most other pastures and meadows have dried up. They also select sericea in their soil and water conservation programs because of its vigorous growth, long life, self-mulching habit, and extensive root system which improves the soil and protects it from erosion. The average rainfall in this area is nearly 50 inches a year, most of which falls as hard, driving rainstorms in normal years.



Mowing 15-inch-high *Sericea lespedeza* on Dutch Creek stock farm in the Yell County Soil Conservation District.

Sericea grows successfully on shallow or deep soils with varying degrees of native fertility. It also is grown on unproductive borders along margins of woods and on

odd areas, to provide wildlife cover.

Perry King, a cooperator in the Franklin County Soil Conservation District, harvested 100 tons of high-quality hay from 65 acres of *Sericea lespedeza* in 1960, despite a prolonged summer drought. In 1958 and in 1959, years of normal rainfall, approximately 200 tons were cut from this same acreage.

King has 100 acres of *Sericea lespedeza* on his 983-acre livestock farm. Thirty-five acres have been placed in the Conservation Reserve, as have large acreages in Arkansas. Such areas are providing excellent habitat for quail and many other birds, while improving and protecting the soil for the future.

King reports that his cattle eat sericea hay readily when it is mowed before it reaches a height of 15 inches, and provided it is baled as soon as possible after it is dry enough, normally the same day it is cut. His experience has been that if sericea lies in the field



Cattle grazing in 40 acres of *Sericea lespedeza* on Glen F. Wallace farm in the Mine Creek Soil Conservation District after 41-day drought.

Note:—The author is agronomist, Soil Conservation Service, Little Rock, Ark.

too long it sheds its leaves and the hay is stemmy and of poor quality.

King used to mow his sericea three times a year. The last three years he has cut two hay crops a year and harvested a seed crop in the fall. He has found that allowing the sericea to grow for seed helps maintain a vigorous stand. In 1958, 3,300 pounds of clean scarified seed was harvested, and 2,500 pounds in 1959; but in dry 1960, the yield dropped to 600 pounds.

King planted his first sericea in 1946, as a result of information supplied by J. O. Murphy, work unit conservationist of the Soil Conservation Service at Ozark.

"I wore out the knees of my pants the first year showing Mr. King the small, spindly sericea plants," Murphy recalls. "I had to work closely with Perry to keep him from plowing it up."

Roy Rogers of the Rich Mountain district harvested 443 bales of hay in two cuttings from 5 acres of Sericea lespedeza in 1960. Rogers gets leafy, high-quality hay by cutting his sericea before it reaches 14 inches and baling within 24 hours. Rogers planted his sericea in 1957 and 1958, on a clean, firm seedbed to which 200 pounds of 20-percent superphosphate and 2 tons of lime to the acre had been applied.

Sericea has been used considerably for grazing by Rich Mountain district cooperators, especially during the drought years of the early 1950's.

M. H. "Chick" Otwell of the Washington County district sells all his surplus sericea hay to riding-horse owners in nearby Springdale. He says they pay a 50-percent premium for sericea hay over other hay available in the area.

In 1950 "Chick" mowed his 16-acre sericea meadow once and put up 700 bales of hay. The field was grazed the remainder of the season. In 1959, about 1,400 bales were harvested from two cuttings. Otwell has not fertilized his sericea since it was planted in 1956.

Soil Stewardship Week

A Community Undertaking

By Paul Hutton

ONE of Tennessee's most effective county-wide Soil Stewardship Week observances in 1960 was sponsored by the two-year-old Jefferson County Soil Conservation District. Systematic planning and leadership in this endeavor were mainly responsible for the excellent results.

The careful preparation by the district and cooperating churches, businesses, and agencies culminated in the following activities: (1) Material and assistance on the subject was offered, in writing, to every known minister in Jefferson County; (2) 2,000 special church bulletins, posters, and booklets were distributed; (3) a series of articles, written by local ministers, were published in the local papers; (4) a television program was presented; (5) an on-the-farm study of conservation practices for ministers and laymen was made prior

to Soil Stewardship Week; (6) Soil Stewardship programs were conducted by young people's church groups; and (7) special sermons were delivered in 33 churches.

Planning for these activities was started five months in advance. A six-man committee was asked by the district to work out the details for the observance. The committee was composed of ministers R. B. Pritchett, Church of the Brethren; Roland Aytes, Methodist; Zachary Piephoff, Presbyterian; and Bob McCray, Baptist. Serving with them was A. B. Strand, of the University of Tennessee, and district board member Charles T. Baker.

Reverends Aytes, Piephoff, and McCray jointly prepared and sent a letter explaining the proposed program to all other ministers of the county. They offered materials and assistance to any church or group interested in a special service on Soil Stewardship. Informa-

Note:—The author is work unit conservationist, Soil Conservation Service, Dandridge, Tenn.



Reverend Roland W. Aytes, Methodist minister, discusses Soil Stewardship observance with a group of ministers and laymen on a conservation tour of the Jefferson Soil Conservation District.

tion kits were made up and were ready for distribution as soon as requests came in. The committee made many personal visits to interested ministers.

Three weeks before the observance, Aytes, Piephoff, and McCray submitted a three-part series of articles to the local newspapers. The series, slanted to general public readership, was published, one article each week.

District Chairman Neal Scarlett,

Reverend Aytes, and the Soil Conservation Service technician presented a television program on the significance of Soil Stewardship Week on Station WATE-TV in Knoxville.

County Judge Ray Sherrod made it official by proclaiming May 22-29 Soil Stewardship Week in Jefferson County.

One of the most pleasant tasks of the Soil Stewardship Committee was conducting a field study to

show ministers and laymen what good stewardship means on the land. On May 2, the group met in a contour stripcropped field on the farm of John C. Taylor. Besides stripcropping, the group saw sod waterways, farm ponds, wildlife areas, multiflora-rose fences, and improved pastures and meadows.

The committee estimates that more than 3,000 persons heard the Soil Stewardship message, in addition to those reached by newspapers and television.

Tall Fescue—A Winter Grass For Florida

By H. E. Van Arsdall and LeeRoy Wiggins

A PRACTICAL year-round grazing system dreamed of by cattlemen in Florida's Perdido River Soil Conservation District shows promise of coming closer to reality.

They can credit this prospect to renewed interest in and successful experience with tall fescue as a winter pasture grass. So can the soil conservationists who have been searching for still more adequate soil cover than that provided by the Bahia and Coastal Bermuda grasses that have met warm-season needs.

Fescue was first introduced in this district in the early 1940's, but it failed to give the miracle performance expected. In the last few years, better fertilization and management methods have been responsible for the renewed interest in fescue—not as a miracle grass, but as one that is filling in the gap between other grasses in the grazing system.

District farmers are using this grass in several ways. Some depend on it for all or most of their winter grazing, others to supplement

small-grain pasture. Some dairymen use it in the winter as roughage replacement for hay or silage. In addition, fescue is proving to be a valuable grass for use in waterways, where it furnishes additional grazing for cattle gleaned cultivated fields during the winter.

Crawford Rainwater is one of those farmers who depend on fescue for most of their winter grazing. This past fall and winter he grazed 70 head of brood cows on 40 acres from October 20 to January 20; and in the winter of

1959-60 he grazed cows and yearlings at a rate of almost three head to the acre for five months. Liberal fertilization with nitrogen plus phosphate and potash has enabled him to obtain this relatively heavy grazing.

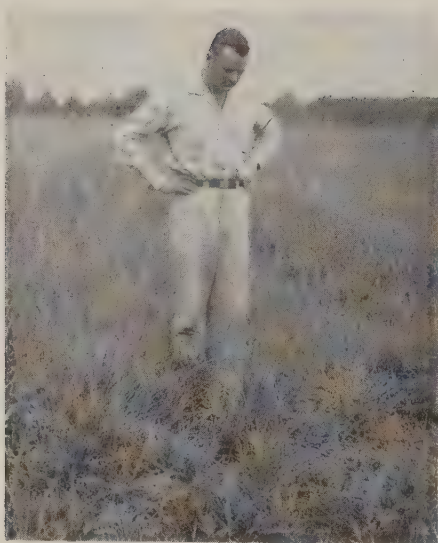
"I don't know of any way to winter cows any cheaper than with fescue," said E. J. Gibbs, Rainwater's farm manager.

An additional 90 acres of fescue was planted on this farm last fall and will be ready to graze in the fall of 1961.



Angus brood herd grazing tall fescue pasture on Crawford Rainwater ranch.

Note:—The authors are, respectively, agronomist, Lake City, Fla., and work unit conservationist, Molino, Fla., both of the Soil Conservation Service.



Fescue pasture grazed until April 20 had 5½ tons of green material an acre when photographed on May 10.

A. B. Mason, who planted his first fescue 4 years ago on a 40-acre field, had this to say: "I like the grass because it is ready for grazing in early fall when I can buy steers cheaper than later in the season." He planted 25 acres last fall, to be grazed in the fall of 1961, when he plans to plant another 20 acres. In addition, he uses fescue to protect water-disposal areas and steep slopes surrounding cultivated fields.

George Classon uses his fescue for soil protection and grazing. He planted it on land that is unsuitable for row crops or small grain. Erosion had washed away most of the topsoil. Fescue fits into his system by providing pasture feed in the fall and early winter before small-grain grazing is available, and again after his cattle are taken off the small grain in the spring.

Ward Eicher grazes his 35 head of milk cattle on 10 acres of fescue to supplement small-grain pasture. Last fall cattle were taken off millet in early October and placed on fescue. Although fescue generally is not considered a good milk producer, Eicher said he could see no drop in milk production when the cows were taken off the millet. He said he did notice an increase in milk flow when cattle were turned

on wheat this winter, but thought it was the quantity of grazing rather than quality that made the difference.

Martin Crary & Sons have 15 acres of fescue they use as supplemental feed for their dairy herd. This past fall the 80 head of milking cows were grazed for 30 days on this area. Crary said, "We think of fescue as standing hay, reducing our hay ration by one-half when cattle graze fescue." When the cattle were taken off fescue, there was a slight drop in milk flow even though the hay ration was doubled.

Although fescue has been thought to be out of its range in the Gulf Coast area, such experiences during the last few years point to its

having a definite place in the grazing system. It fits in well with small-grain production or, with sufficient acreage, will provide all the grazing during fall, winter, and early spring.

Dr. C. E. Hutton, Director of the West Florida Experiment Station at Jay, and Dr. L. S. Dunavin, agronomist at the station, are studying the use of fescue. Their results already have given much valuable information on grazing management and fertilization. Research now in progress can be expected to give farmers further guides in the use of fescue with grains and other concentrated feeds in winter management of cattle.

Little's Bermuda Pays Big

By Bernice DeShong

IT was a tough decision for Jim Little three years ago when he converted his excellent Washita bottomlands from high-yielding row crops to bermudagrass.

But farm machinery was expensive, farm labor was hard to get, and moisture conditions were often a problem; so Jim decided to revamp his bottomlands.

Little has one of the best bottomland farms in Garvin County,



Jim Little and a part of his Angus herd on one of Little's good bermudagrass pastures.

Okla. For 10 years, the principal crops on his 540-acre farm had been alfalfa, small grain, corn, and grain sorghum. When moisture conditions were good, the fertile bottomlands of the Washita produced excellent corn. But they were not always favorable, and four years ago Little decided it was time to try out a new crop. He chose bermudagrass.

He was reluctant, however, to put very much of his good bottomland into bermudagrass. He was afraid it might be hard to get rid of if he should decide to go back to row crops. The first year he put only 15 acres into Midland bermudagrass. The second year, he planted an additional 27 acres, and last year another 44 acres, bringing the total to 86 acres.

Jim says he grazed 89 to 110 mature cows and 66 calves on this pasture; and, realizing that he had

more grass than cattle, he fenced off 30 acres for hay. This 30 acres produced 1,690 bales of excellent hay in 1960.

Little plans to plant an additional 14 acres to bermudagrass this year to round out a 100-acre field.

Prior to planting of the bermudagrass, this land had been in hairy vetch for two years and was used as supplemental pasture. Little attributes the vigorous start of his bermudagrass to the available nitrogen provided by the legume. After the bermuda became established, he applied fertilizer and phosphate at around 200 pounds per acre and overseeded the grass with vetch, buttonclover, and Korean lespedeza.

Little has been a cooperator with the Garvin Soil Conservation District since 1948. He was given a Bankers Award in 1959 for his out-

standing accomplishments in soil conservation.

Jim Little is a grassland farmer now, and likes it. He figures it this way: For the cost of one tractor, he can buy 20 additional cows. In grassland farming, he doesn't need the tractor, and the calf crop harvested from these 20 cows is worth more than the row crops harvested with the tractor.

"And I have discovered," Jim pointed out, "that bermudagrass—far from being an enemy of the soil—is one of the best soil builders I have used. It prevents erosion and adds the needed organic matter. And I also discovered that alfalfa can be planted after bermudagrass, and that small grain, such as wheat and oats, can be planted into the bermudagrass."

No sirree—Jim Little isn't worrying any more about being able to get rid of his bermudagrass.

Wheatgrasses Do a Job For Arizona Rancher

By Mervin H. Wallace

OWNER Kel Fox of the Two Bar Cattle Company in Cocino County in north central Arizona has found wheatgrass the answer to supplementing the forage and relieving the grazing pressure on his native rangeland.

Fox started planting wheatgrass in 1950, with 10 pounds of seed supplied by the Soil Conservation Service. The next year he became a cooperator with the Oak Creek Soil Conservation District; and the SCS was able to provide him with 10 more pounds of seed, consisting of regular intermediate wheatgrass, mountain brome, Russian wildrye, crested wheatgrass, slender wheat-

grass, and pubescent wheatgrass.

Fox seeded the grasses by hand at his Woods Spring headquarters in a holding and roundup pasture used by the former owner. All except remnants of the native grasses had been killed by overgrazing and trampling. Weeds had taken over, but they were not controlling the sheet and gully erosion that threatened to destroy what once was a beautiful meadow.

Fox succeeded in establishing enough of the wheatgrasses to harvest seed for expansion of the Woods Spring plantings. And within a few years he also was able to seed the entire meadow acreage at his Clay Park ranch, where he harvested 1,500 pounds of seed



Fox and son Jeff standing in field of tall wheatgrass on Clay Park ranch.

Note:—The author is agronomist, Soil Conservation Service, Phoenix, Ariz.

from 25 acres. He sold about half of the seed for 50 to 75 cents a pound and planted the rest in other fields. The Clay Park meadows had been used to raise oats as supplemental feed; but the soil had lost much of its organic matter, and the oat-hay yields had dropped to an unprofitable half a ton to the acre.

The most successful of the numerous ways tried in his grass seeding was with a grain drill with fertilizer attachment. He planted in a seedbed prepared with an offset disk. This placement of fertilizer gave the grass seedlings the extra advantage needed, with limited moisture, for outgrowing the weeds; and bindweeds had almost disappeared after two years' competition.



Yearling Herefords grazing tall wheatgrass before going onto national forest range in background.

As soon as Fox had completed seeding his 95 acres of intermediate wheatgrass and 30 acres of tall wheatgrass, he began to work out techniques to fit the plantings into his overall ranch management program. Fox is naturally a curious man and wants to know the "why" before he goes all out for new methods. He has spent several years trying different fertilizers, applied at various rates and at different times. He has concluded that nitrogen and phosphorus fertilizer appears to be best for his soil, and that there is not too much difference between applying it in late fall or early summer. The soil is too wet to apply fertilizer in the spring.

He believes he has a good carry-over of unused fertilizer when the plants are unable to utilize all of it during spring and fall growing periods of limited moisture, which comes as winter snows and summer rains. Fertilizing results in quicker green-up in the spring and later maturity in the fall, increases the density of the grass, and makes it more palatable to grazing animals, including deer and elk which abound in the adjacent forest.

The management plan for Fox's ranch operation, which includes grazing on the Coconino National Forest, provides for no pasture's being grazed longer than four months in a year. The herd is split up part of the year and placed in different pastures. About June 5, the herd is reunited, when the yearlings are detached and put on the wheatgrass pastures until around October 1. They are first put on the tall wheatgrass until it has been properly used, and then are moved to the intermediate wheatgrass. He tries to leave at least 8 to 10 inches of stubble on the tall wheatgrass and 5 to 6 inches on the intermediate. After that date, he moves everything into holding pastures around the Woods Spring headquarters for shipment or movement to winter range. Supplements are fed only to bulls and weaner calves.

Clipping data indicate that the wheatgrasses are outyielding the native grasses. For example, the regular intermediate, without fertilizer, in 1957 yielded 2 tons of air-dry forage an acre, while adjacent native blue grama yielded only $\frac{3}{4}$ ton. Fox's records show that the yearlings have gained 295 pounds per animal in less than four months on the wheatgrass pastures, or about 2.5 pounds a day.

Kel Fox not only practices conservation, he also preaches it. During the three terms he served in the Arizona House of Representatives and one term in the State Senate he was the chief sponsor of the "Range Land Amendment" to



Amur strain (left) and regular strain of intermediate wheatgrass on Kel Fox ranch at Woods Spring headquarters.

the State soil conservation districts law, adopted in 1953, providing that grazing land as well as "farm" land may be included in the districts. He is now serving his third year as a supervisor of the Verde-Oak Creek district, which chose him outstanding conservationist of the month for February 1955. He also is active in the Tall Pines and Camp Verde Farm Bureaus and is Secretary to the Arizona Water Resources Committee, which sponsors a million-dollar-a-year watershed management research program.

Kel, a Princeton graduate, came to Arizona in 1921 with his father, Frederick Fox. In 1935 he became manager of the Two Bar Cattle Company, which was formed after his father and Frank Gyberg dis-



Fox harvesting intermediate wheatgrass for use on other parts of his ranch.

solved their partnership in the Foxboro ranch. He is proud of the job he has done using the wheat-grasses and better management to improve his range and control erosion. The gullies are healing over, and sheet erosion is almost a thing of the past on the ranch that the Foxes' sons, Jeff and Grady, are expected to take over some day.



POLITICS AND GRASS: THE ADMINISTRATION OF GRAZING ON THE PUBLIC DOMAIN. By Phillip O. Foss. 236 pp. 1960. University of Washington Press: Seattle. \$4.50.

"Politics and Grass" starts with a brief history of the public domain and the various acts of Congress designed to dispose of these lands. The author's explanation of why most of these attempts failed provides a suitable background for the detailed study of the policies and administration of the Taylor Grazing Act of 1934, which is the main subject of his book. The picture he paints is not a pretty one and reflects little credit on some of the actions of the early administrators of this legislation or on those of many leaders of the livestock industry. These actions, the author feels, have circumvented the basic purposes of the legislation in many areas.

The author thinks the basic error in judgment was made when Secretary Harold L. Ickes told the Congress that this area of 160 million acres—larger than France—could be administered for \$150,000 a year and that the grazing fees charged the stockmen should not be allowed to exceed these costs. The Act itself provided that "reasonable fees" would be established, but for the next twenty years the

stockmen and their Congressional supporters were able to use the Secretary's testimony as a weapon to hold the fees to a minimum and, in turn, prevent the employment of a force adequate to administer the lands properly.

The first Director of Grazing, with a force of only twenty men, turned for help to the stockmen whose use of the public range he was supposed to regulate. Stockmen's boards were set up. While these were called "Advisory Boards," in practice they were not only allowed but encouraged "to become the local governing agency as to all matters of a range regulatory nature concerning their particular districts." They largely decided who would use the range and how many animals would be allowed to run on the public lands.

As a student of government, Mr. Foss has used the case history method to develop his theme that a relatively small group with powerful political support has been able to influence public policy, develop the rules, and eventually assume the powers required to execute that policy in a manner favorable to its own interests. He concludes that under the domination of the Advisory Board system there has been little improvement of the public range and that injury has not been stopped, although it has been lessened.

The study was based on a careful examination of much of the available source materials. These included minutes of the Advisory Boards, records of Congressional hearings, working files of the Bureau of Land Management, and firsthand information from many of the principals involved, both public officials and stockmen. Although the facts presented may not be disputed, their selection and interpretation is another matter.

To this reviewer, the book is decidedly one-sided. The author gives great emphasis to incidents in which the stockmen exercised an improper influence but little credit

to their many constructive actions, or to the highly important assistance they rendered in efforts to help carry out the provisions of the Taylor Grazing Act.

—F. G. RENNER

PRIVATE GRAZING AND PUBLIC LANDS. By Wesley Calef. 292 pp. Illus. 1960. University of Chicago Press: Chicago. \$9.50.

Passing of the Taylor Grazing Act by Congress in 1934 put an end to hard-fought political contests over disposal of the public domain in the western United States. It ended 75 years of free common use of the remaining "vacant, unappropriated, and reserved" Federal lands and substituted a system of leasing them for grazing.

Western livestock association leaders had campaigned vociferously for years for sale of these lands on a preferential basis to ranchers using them at time of sale. The opposition lambasted the plan as a wholesale land grab. Meanwhile, many rangelands were being damaged severely by users competing for free grass.

The author says the principal aim of his monograph is to provide reliable observations and information, primarily for easterners, who have an inherent responsibility in this matter, on how we should act with respect to the Taylor grazing lands.

Dr. Calef reaches his goal quite admirably in part. He sets up his case with courage and reviews public land administration fairly and frankly. Praise is given to Bureau of Land Management personnel for devoted service under continual fire. Reasons for the Bureau's failure to improve the natural resources of these lands are evaluated, and recommendations made for improvements. One of the big problems is the difference of opinion between livestock organizations and the BLM regarding needs for improving public lands, including

If your address changes, please notify us of your complete new address, including zone or RFD number, and include old address with our code number as shown above.

cuts in numbers of animals allowed to graze, and upgrading of grazing fees proposed by the Bureau.

There are sound descriptions of grazing districts in western Wyoming, but summaries of the other grazing districts are missing. The reader also should have been given more public domain history, plus a better review of the colorful warfare of words between the contending factions.

—B. W. ALLRED

Tests Show Best Nitrogen Fertilizer Rates

Annual applications of 80 to 160 pounds of nitrogen an acre on six forage grasses grown under irrigation proved to be the most efficient fertilization rate in a three-year study at Colorado State University.

The study was conducted with smooth brome grass, orchardgrass, tall fescue, tall oatgrass, and intermediate and tall wheatgrass.

At the 80- and 160-pound rates, intermediate and tall wheatgrass produced the highest yields, followed by tall fescue and tall oatgrass. Smooth brome grass and orchardgrass produced the lowest yields at these rates. The yields averaged 2.30 tons an acre for the 6 grasses on a check plot with no nitrogen applied, 3.20 tons an acre at the 80-pound level, 3.75 tons at the 160-pound level, 4.25 tons at the 320-pound level, and 4.45 tons at the 640-pound level.

Nitrogen applications increased the amount of total nitrogen in all

of the grasses. Increased nitrogen content indicates a higher crude protein content. High rates of nitrogen fertilizer—320 and 640 pounds to the acre—resulted in a loss of stand and reduced the percentage of nitrogen fertilizer recovered by the forage from the soil.

Generally, yields continued to increase at rates above 160 pounds,

as did the nitrogen content of the grasses. But the applied nitrogen recovery rate from the soil (the relation of the amount of nitrogen used by the plant to the amount applied) usually reached a peak at the 80- or 160-pound rate and declined sharply with the higher applications.

A New Editor

This is the last issue of SOIL CONSERVATION for your editor of the past five years, who will be on another assignment before retiring from the Soil Conservation Service in a few months. Beginning with the June issue, your new editor will be Frank B. Harper, himself a 25-year veteran in the Service's information program in the field and in Washington. A graduate of Arkansas Polytechnic Institute and the University of Missouri School of Journalism and an Associated Press man for a decade, he brings to SOIL CONSERVATION a working lifetime of reportorial and editorial experience.

Editing SOIL CONSERVATION has been perhaps the most satisfying experience of my own 26 years with the SCS. Nothing ever can be more important to all of us—this space age notwithstanding—than the conservation and efficient use of our soil, water, and related resources. I feel sure this magazine will continue to make its important month-by-month contribution to attainment of this goal for which it has strived since the first issue in August 1935. My thanks to all who have contributed to its columns and who have read SOIL CONSERVATION during my tenure as editor.

—TOM DALE

Grazing studies by the Louisiana Agricultural Experiment Station indicated that Coastal bermudagrass is far superior to common bermuda or Dallis grass. The experiments showed that 600 to 800 pounds of salable beef can be produced per acre by grazing, with the surplus forage being cut for hay to be fed back to the cows during the winter.

Tests at the University of Nevada Agricultural Experiment Station showed that irrigated pastures can produce up to 1,100 pounds of beef to the acre. The average number of pounds produced by the four grasses used, in 1959 and 1960, were: Orchardgrass, 1,122 pounds; smooth brome grass, 954 pounds; tall fescue, 952 pounds; and intermediate wheatgrass, 900 pounds.

Approximately 28.6 million acres of cropland in the U. S. will be held out of production in 1961 under the Conservation Reserve.

JUNE 1961

Soil Conservation





Growth Through Agricultural Progress

"We must look at conservation in the light of the interdependency of all programs, whether they be in water, forestry, game and fish, soil conservation, mineral development or recreation."

—ORVILLE L. FREEMAN



COVER PICTURE.—This 18-year-old farm woodlot in Carver County, Minnesota, illustrates how trees fit into the pattern of good conservation land use.

VOL. XXVI, No. 11

JUNE 1961

CONTENTS

PAGE

- 243 Conservation on Farm Woodlands
By Donald A. Williams
- 244 Conservation Tree Farming
by Herbert F. Gaines
- 246 Taking Guesswork Out of Nursery Stock Needs
By A. L. Ford
- 248 Tree Crops To Fit the Land
By T. B. Plair
- 250 Sandhills Ranchers Go For Trees
By Lorenz F. Bredemeier, Walt Ekdahl, and Donell D. Sylvester
- 252 Pine Trees For Cotton
By Dan Boone and Claude K. Compton
- 254 Woodland Clinics For FFA-4-H Boys
By Leo L. Fisher
- 255 Over-the-Row Cultivation Speeds Tree Care
By Elmer L. Worthington
- 256 Hunting Preserve in Ohio
By David C. Brooks
- 258 Trees Won't Grow Just Anywhere
By Lester Fox
- 259 A Faithful Soil Steward—A Profile
By Ronald Church
- 260 Community Push Gets Trees Planted
By Eudis Singleton
- 262 Erosion Control in Woodland Harvest
By Robert A. Dellberg
- 263 Book Reviews

Soil Conservation

ORVILLE L. FREEMAN
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

FRANK B. HARPER, Editor

15 CENTS PER COPY

FOREIGN—\$2.25 PER YEAR

\$1.50 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Conservation on Farm Woodlands

By Donald A. Williams

MORE of the Nation's farmland is in trees than is in any other crop except grass—or nearly one-fifth of the total farm acreage. Soil and water conservation on woodland accordingly is a basic part of conservation farm planning and land use, as it has been from the start nearly thirty years ago.

Most of the nearly 3½ million farmers who own woodland are in soil conservation districts, through which landowners obtain the technical help of the Soil Conservation Service in land-use planning and conservation treatment of cropland, pastureland, woodland, and wildlife areas. In 1960, nearly half of all the trees planted on private lands were on farms and ranches cooperating with districts, or almost a million acres. This represents tremendous progress toward meeting the needs of the Nation!

As interest continues to mount in farm woodlands and windbreaks, farmers and ranchers are requiring additional technical help from both public and private sources, including that of the Service in relating soils information to the growing of wood crops as part of overall conservation and land-use planning. When technical assistance in conservation on woodlands is not available from State forestry agencies, and where it is needed, the Service provides it to private landholders as a necessary part of a conservation plan for a land unit. As two-thirds of all farm woodlands are less than 40 acres each in size, this very often is the farmers' primary source of such help.

Our field technicians are trained by woodland conservationists and

forestry specialists to help farmers in selecting land suited for tree planting and with other measures involving trees and shrubs. All of these are correlated with the complete conservation farm plan. This approach is dictated by at least two practical considerations:

1.—Lands not suitable for cultivation, or sometimes even for high-producing hay or pasture, often are ideal for growing trees, which permanently protect such lands from erosion and conserve water.

2.—Timber has been shown by research and experience to be the most profitable crop for those lands on which the interpretation of soils indicates trees to be the best-suited plants to grow on them. In other words, a good wood crop will pay out better on such soils than will low-yielding cultivated or grass crops, even though the latter can be grown on them. This rating of soils for the production of wood crops has been one of the most significant recent contributions to conservation on woodlands.

When we consider that nearly half of the privately owned commercial forest land in the United States is on farms, the importance of conservation on farm woodlands becomes apparent. As part of the Nation's total program of farm and ranch conservation planning and action, it means safeguarding that half of our timber resources and contributing proportionately to sustaining related agricultural, community, and industrial economies.

A look at the figures on what soil conservation district cooperators have done in conservation on woodlands points up the impact of their successful efforts in this as-

pect of resource conservation. Assuming the same rates of accomplishments for this fiscal year as those achieved last fiscal year, they will have planted about 8¾ million acres of trees by June 30, 1961, in addition to some 43,000 miles of field windbreaks and nearly 9 million rods of hedgerows.

Comparable figures show approximately 19½ million acres of such woodland improvement as thinning, harvest cutting, brush control, and pruning; and 71¾ million acres of woodland protection measures like fencing, grazing control, firebreaks, and erosion control. These accomplishments, of course, reflect the combined impact of cooperative action: education, technical services, credit, cost sharing, fire control, etc., but, perhaps above all, local leadership and responsibility.

A still bigger job of conservation on farm woodlands and tree planting lies ahead. The recently completed National Inventory of Soil and Water Conservation Needs shows that, based on present conditions of the 435 million acres expected to be in non-Federal forest and woodland by 1975, more than 150 million acres needs timber stand improvement and more than 70 million acres needs planting.

The President's message on natural resources directed the Secretary of Agriculture to develop a program of increased assistance to private woodland owners, in cooperation with State agencies. The job remaining can best be achieved through the cooperative efforts of landowners and operators, local and State governments, and of agencies equipped to help them.

Conservation Tree Farming

Is a Way of Life With the Wilsons

By Herbert F. Gaines

The Francis Wilsons' tree farm in western Washington is a working example of the success that comes from fitting the right kind of farming to the land instead of trying to make the land grow crops for which it is not suited.

It is the "Wilsons," plural, because the whole family has made a teamwork project of building up the farm since they bought 680 acres of logged-over land in Cowlitz County in 1948 and soon realized it wasn't suitable for the conventional farming they had planned. Francis, Mrs. Wilson, and the 5 of their 9 children who had a hand in remaking the farm during that dozen-odd years share satisfaction in their joint accomplishments. As Francis says:

"My tree farm gives me peace of mind and a feeling of personal accomplishment."

The Wilsons have good reason to

be proud: Their place was chosen Cowlitz County Tree Farm of the Year for 1959; they have been marketing Christmas trees for several years; and the farm has enabled them to rear their large family despite costly injuries suffered by Francis and two sons, Robert and Bill. When the boys were hurt while salvage logging, Francis sold 400 acres to meet the bills, but later bought another 100 acres, bringing his present holding up to 380 acres.

The Wilson land today contrasts sharply with the original purchase of burned-over, brushy land on the western slope of the Cascade Mountains. Francis was working with a construction company in the Portland-Vancouver area then, and his wife and the children took care of the job of getting settled on the farm, which closer inspection revealed to be cut up by numerous

draws and creeks and plagued by rock outcrops.

It clearly was not a tillable farm land; but it was timber-growing land!

The Wilsons promptly became cooperators with the Cowlitz Soil Conservation District, and a soil survey was made by the Soil Conservation Service. It showed most of their land to be in capability classes IV to VII, with only a small amount of creek bottomland being in classes II and III and suitable for farming. This land is kept in hay and pasture for feeding a small herd of beef and dairy cattle.

Francis was injured on the job that same year, and found he no longer could follow construction work. That was when he decided definitely on tree farming, and the family enthusiastically agreed.

"We'll operate just like the big timber companies," Mrs. Wilson declared. She, with the children and a brother, already had gained experience in salvaging slab from one of several piles left on the farm by mills that had operated in the valley years before. During 1948 and 1949, they cut and sold more than 4,000 cords for pulp.

Wilson's sons started planting trees in the winter of 1949, when they put out 15,000 Douglas fir seedlings, and have hand-planted trees every year since—75,000 one year and nearly half a million all together. The Wilsons have drawn upon technical assistance from Soil Conservation Service technicians, the Vocational Agriculture instructor, the county agent, and the



The Wilsons' tree farm lies here in the Little Kalama River valley.

Note:—The author is work unit conservationist, Soil Conservation Service, Kelso, Wash.



Bill Wilson with spool alder removed from land to be scarified and cleared of brush for planting to Douglas fir.

State Farm Forester. They get their planting stock from local timber companies, the County Extension Service, and the State Department of Natural Resources. Some planting has been done with hired crews.

They also have tied in the salvage of "left behind" logs with their planting program, getting from their sale operating capital and, in the same operation, scarifying the land with a bulldozer and land-clearing blade preparatory to planting it. These Douglas fir logs were left when the country was originally logged. It costs about \$18 a thousand to get them out of the brush, yard, and haul them to market. The price received for these logs has varied over the years from \$24 to \$40 a thousand board-feet. They salvaged 300,000 board-feet of these logs in 1960 alone, and Wilson says, "I am confident we have salvaged over three million board-feet in the past 10 years."

Before salvage, the Wilsons remove red alder of marketable size, selling the large, mature trees for saw logs and medium-size trees for pulp. Smaller alder is sold to a

paper-spool market at a profit of about 8¢ an 8-foot stick, for material that has to come out in preparation for planting Douglas fir. Scarification costs run \$30 to \$35 an acre, when they use their own dozer. As a precaution against

trees which may not survive, and for an early income from Christmas trees, they overseed with one-fourth pound of treated rodent-repellant seed to the acre.

The Wilsons control brush so it will not suppress the young fir, mostly by hand-slashing with machetes. Francis figures, "I must have slashed 80 to 100 acres, and have worn out 15 to 20 machetes." They also have slashed 15 miles of survey lines.

The planted areas start yielding income from Christmas trees in 6 to 8 years. The Wilsons have harvested 1,500 to 2,000 trees a year, for which they received an average of \$750. They have contracted 9,000 Christmas trees for 1961. Christmas trees removed permit more light to get into the remaining stand.

This is the first thinning. Later thinnings will provide poles and piling. During these early thinnings, final-crop trees are selected on about a 20- by 20-foot spacing, or approximately 120 trees to the acre, as compared to 680 trees planted on an 8- by 8-foot spacing.



Francis Wilson and one of five ponds along his timberland roads. It stores water for fire fighting, is stocked with fish, and has a springboard for swimmers.



Inspection team that chose Francis Wilson as Cowlitz County tree farmer of the year. (Left to right: the late H. William Freed, forest engineer; Hoe Hill, Longview businessman; Wilson; and W. C. Button, Longview banker.)

The end-crop trees are pruned to produce clear 16- to 18-foot logs. On some areas, where the trees are to be marketed for piling and the soils are highly productive for Douglas fir, Wilson permits the trees to remain close together without much thinning.

The Wilsons are always fire conscious. When the woods dry out in the spring, no one smokes after leaving his headquarters. They have put in a 40-mile network of fire trails and logging roads, along which they have built five ponds to supply water for a pump truck in case of fire. Their long-range conservation plan, prepared with the assistance of SCS technicians, calls for two more ponds. The ponds are stocked with fish and used for swimming. There also is good fishing in the Little Kalama River that flows between their house and the barn, and hunting is good on the farm.

In 1957 the Wilsons developed a rock quarry, which to date has brought them in \$7,000. They will show you the work they are doing and explain the technical and other assistance they have received. Conservation tree farming has become a way of life with the Wilsons.

Taking Guesswork Out of Nursery Stock Needs

By A. L. Ford

SOUTH Dakota's soil conservation districts and commercial nurserymen have found through a dozen years of successfully estimating their tree-planting needs in advance that it isn't necessary to fall back upon less desirable substitutions or to end the season with wasteful leftover stocks.

This is one of several States using the estimating method to hold nursery production as closely as possible to planting needs, but South Dakota districts doubt if any others have attained a closer margin of accuracy in their estimates than they have achieved. A record has been kept for each of the 12 years of estimated nursery stock needs compared to the number of trees ordered by the districts. For all years, disregarding individual species, the estimates and actual procurement have been within 5 percent of each other.

Soil conservation districts, or others involved in large-scale tree planting, generally are in position to estimate with reasonable accuracy the species and amounts of stock needed for two or three years ahead. Too often, however, the nurseries have been left in the dark as to these future needs, and, as a consequence, planting stock might not be available when needed. Such lack of information also usually makes necessary wholesale planting-stock substitutions, with less desirable species forced into the planting compositions.

First steps toward a solution to the problem were taken in the late

1940's, through the South Dakota State Farm Forestry Council, composed of representatives of all State and Federal agencies involved in tree planting. The State Nurserymen's Association representative also is a member. At several Council meetings, the soil conservation districts reported that planting stock of the desired kinds and amounts often was not available when needed to carry out their planned programs; and the commercial nursery people pointed out that they were forced to operate pretty much on a hit-and-miss basis, because of not knowing the districts' requirements in advance.

As a result, the Council officially recommended that all agencies engaged in tree planting in the State each fall prepare the best possible estimates for two years in advance, and furnish them to all commercial nurseries in time for their fall seeding operations. Because the soil conservation districts plant approximately 85 percent of all trees in South Dakota, they and the assisting Soil Conservation Service were most concerned. The districts, through their State Supervisors Association, put the plan into motion without delay; and it has continued since, with occasional improvements. This is the way it works:

During August and early September, all district boards of supervisors, assisted by the local SCS work unit conservationists, develop detailed species-by-species estimates on nursery stock needs for the next three years. The longer period was adopted six years ago at the request

Note:—The author is woodland conservationist, Soil Conservation Service, Huron, S. Dak.

of the nurserymen, through the Farm Forestry Council. Criteria considered in arriving at the final planting stock needs figures include: the acreages of completed planting plans ahead, volume of planting accomplished during recent years, types of plantings and the amounts of each, soil types on which plantings are to be made, local district cooperator demands and preferences, geographical location and climate of the district, existing economic conditions, and current weather situations.

The estimates are officially approved by the district board, but the board specifies that the estimates are not to be construed as actual stock orders. The districts accordingly are not obligated to buy all of the planting stock estimated. The State SCS office cooperates in analyzing and consolidating the districts' estimated stock needs.

When nurserymen, private or public, as in some States, thus are members of the tree planting team, there results a simple but effective means of assuring availability of planting stock in the kinds, quality, and quantity needed by the dis-



Two-year-old field windbreak effectively controlling severe soil blowing.

tricts. Other advantages include improved planting compositions by materially reducing forced species substitutions; welcome aid to the nurserymen in more accurately planning their operations; and improved cooperative working relationships among all concerned.

Estimating district tree-planting stock needs in advance (1 year) and submitting the estimates to private

or State nurseries were among the recommendations of the Farm Woodlands and Wildlife Committee of the National Association of Soil Conservation Districts at its February 1961 meeting.

Wildlife Likes His Windbreaks

The 13½ acres of trees and shrubs planted as a farmstead windbreak on the Julius A. Just farm near Berlin, N. Dak., have developed into a welcome wildlife habitat. Just says the tree plantings give added food and cover for the wildlife, and nearby Cottonwood Creek provides a good water supply, in addition to a nearby spring. Hungarian partridges, pheasants, and ducks are among the game birds that now nest on his farm.

Besides the farmstead plantings, Just had planted 12 acres of 3-row field belts on his 1,200-acre farm in the East LaMoure Soil Conservation District by 1960, and planned a 7-row farmstead planting and a field belt on another quarter of land for 1961.

"Visitors are amazed at the improvements that have resulted from these plantings," he reports.



Heel-in storage bed for trees before they are taken to Codington SCD farms for planting.

Tree Crops To Fit the Land

By T. B. Plair

Many thousands of American farmers today are in the fortunate position of being able to choose between trees or other crops for all or part of their land and to get technical guidance in making their decisions.

It was not always so. From the time of this country's settlement to as recently as 50 years ago or less, in some localities, trees had to be cleared from the land in humid areas to make way for the plow. There was no market for all of the wood farmers removed from their land, even for fuel; so they burned it where it was felled and piled.

Today, our ability to grow food and fiber crops has increased to such a degree that we now are more assured of adequate supplies to meet our needs than ever before. Meanwhile, wood has become a salable farm crop in great demand for various uses. The production of wood crops accordingly has brought an inviting opportunity for uncounited landowners in many communities throughout the Nation.

The key question they face is whether their land will grow timber crops more profitably than cultivated or pasture crops. And the key to answering that question is the suitability of the soil for growing timber. Soil-suitability information also helps provide the answers to such other questions as what kind of trees to plant, and how much money it is wise to invest in the undertaking.

Provided as an integral part of soil surveys, which are basic to all



Trees, grass, and field crops—all in their place.

sound conservation farm planning and land-use treatment, the woodland interpretation of soils gives the rating of each kind of soil as to: The best kind of trees to grow, how fast they will grow, how much erosion to expect, what limitations exist to getting new stands started, insect or disease problems related to soils that may be encountered, likely damage to the trees from wind, and so on. Woodland soil-site correlation studies are being made on an increasing scale over the country, jointly by soil scientists and woodland conservationists of the Soil Conservation Service and by State forestry agencies and the U. S. Forest Service. Also taken into account in the evaluation are adaptations of research results and information from available local experience and judgment.

Soils of the area studied—which

may be a county or larger area in which the similarity of the soils and other factors indicate certain kinds of trees can be grown under the same conditions—are placed in as many woodland suitability groups as may be practicable. Each group is made up of soils that require the use of similar kinds of conservation practices and other management, and that have comparable potential productivity. These woodland suitability groupings of soils comprise the vehicle by which complete soil-woodland interpretations are presented in county soil survey reports, and in technical materials summarized for the use of technicians working with landowners.

We are beginning to appreciate today how efficiently the American farmer is producing his field crops. Still less understood, however, is the fact that much the same rela-

Note:—The author is head woodland conservationist, Soil Conservation Service, Washington, D. C.

tive improvements have been made in methods and techniques for producing wood crops.

More and more of today's tree farmers are taking advantage of services available to them from public and private sources. Providing specialized equipment for growing and harvesting the wood crop is one of many services available through soil conservation districts, from contractors, or from other sources. The owner of a small acreage, especially, understandably has little interest in growing wood crops unless he can see his way to a successful outcome for his investment and efforts. He needs all such aids in avoiding "road-blocks."

The basic objective of the public agencies having responsibilities for directly or indirectly assisting farm woodland owners is to help them achieve their objectives. In this endeavor, each public agricultural worker has an opportunity and a responsibility. Growing trees on farmland best suited for that use is a job for the owners; but it is a farm job to which various technologies may need to be applied.

The principal ones are forestry, farm management, economics, soils, and hydrology. Soil conservation and other agricultural workers have an important part to play in contributing to the landowner's understanding of his opportunities to improve his total resources and the income therefrom by making effective use of his woodland fields.

There still are millions of acres of farmland being cultivated that would be more productive and better protected against soil losses if planted to trees. The landowner's choice of land use can best be made by using available technological information. Likewise, the more intensive use of existing woodlands needs similar consideration.

In the past, professional foresters were virtually the only sources of farm woodland information and help. Today, soil conservation and other agricultural technicians share the responsibility of helping the farmer to understand the role of his woodland fields in his whole farming operation. His problems may include those of water supply or management, soil and land use, grazing, wildlife, and

even recreation. All of these can directly affect his handling of his farm woodlands. By the same token, land taxes, total farm investment, land uses, farm roads, and fences all may affect the landowner's attitude toward his woodland and his decisions on how to use his land for growing wood or other crops. Conservation payments for woodland practices and low-interest-rate loans on farm woodlands further increase the need to treat the woodland fields as integral parts of the farm.

Most farmers—95 percent of them—enjoy the additional advantage of being in soil conservation districts. The districts are in position to aid them in making effective use of professional and other services in growing their wood crops. Many soil conservation districts are giving much attention to their co-operators' interest in conservation on woodlands. These districts are in position to do even more with the strength they have or can get through group action, at the local level.

Even though possibly only 2 out of 10 farm woodlands are now producing at a reasonably high rate, we must not underestimate their power to produce, or the farmer's ability to use that power to his advantage. As more markets for farm wood crops are developed, as has happened in different localities, we may expect to see increasing examples of this power to produce. Today, conservation on farm woodland is far advanced beyond what it was 50, 30, or even 10 years ago. It is one of the factors that should encourage the other 8 farm woodland owners to get into their woods and see what they need to do to make them an effective part of their total farm operation.



As of January 1, 1961, there were 19,341 Certified Tree Farms in the United States, totaling 54,524,830 acres.



Trees and shrubs fit into the conservation farming pattern.

Sandhills Ranchers Go For Trees

By Lorenz F. Bredemeier, Walt Ekdahl, and Donell D. Sylvester

SOIL conservation district ranchers in the sandhills of western Nebraska's panhandle are getting results from planting trees that would be the envy of their fathers and grandfathers who put in plantations under the incentive of various early-day timber acts.

This area has been noted since pioneer days for its grasslands. One thing needed, from the soil and water conservationists' viewpoint, has been trees—in the right places. Today, as an integral part of their whole-ranch conservation plans, sandhills farmers and ranchers in soil conservation districts are growing more and more trees, for protection of ranch headquarters and farmsteads, livestock, and cultivated fields, and for wildlife.

In addition to planting new windbreaks where they are needed, many ranchers are improving upon the old cottonwood plantings made by the pioneers, including the 5-acre tracts homesteaders once had to plant in order to "prove up" on each 640 acres. Because these old trees have little branching on the



These 9-year-old cedar trees on the Henry Fox ranch in Cherry County are 10 to 12 feet tall and make an effective windbreak.

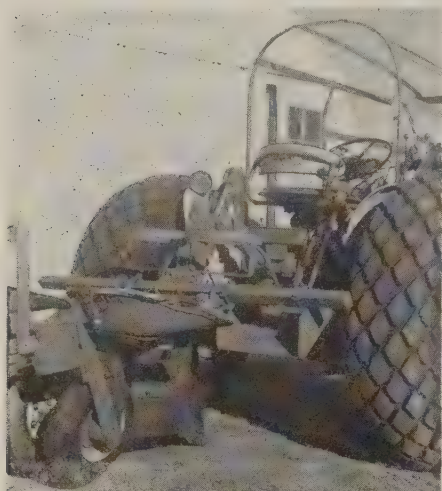
lower trunk and generally have little understory, the ranchers supplement such stands by planting another belt of trees back of them. The new plantings include species that give better protection near the ground and have enough depth to allow a minimum amount of snow to drift through them.

The planting, establishment, and maintenance of deep-rooted conifers and other trees in this area face such problems as limited rainfall, and the hazard in drought periods of wind blowing unprotected soil and thus limiting land preparation for planting. Although most species require cultivation to reduce competition from weeds and grass, and to conserve the limited soil moisture, many soils are sandy, and in dry weather others are too erodible for tillage and cultivation. Moreover, it was found to be necessary to plant species from other areas, some of which proved to be less well adapted than others.

Through experience of ranchers and farmers and the cooperation of

State and Federal agencies, planting techniques and methods have been developed accordingly. Studies of plantings made throughout the years served as a guide in choosing tree species adapted to the various soils. It also was found that one kind of site preparation was not suitable to all soils. Cultivation methods had to be varied to fit. As a result, soils now are classified according to suitability for tree planting into 8 groups.

In one planting method, a seedbed is prepared, where possible, and a cover crop is planted. Trees are planted without further tillage into this cover with a machine, developed from earlier-type planters, that causes little disturbance to the cover so it will remain effective in protecting the soil against blowing. Many soil conservation districts are now buying such planters and hiring crews that plant trees for ranchers and



Cherry Soil and Water Conservation District tree planter.

Note:—The authors are, respectively, range conservationist, North Platte, Nebr., work unit conservationist, Oshkosh, Nebr., and work unit conservationist, Valentine, Nebr., all of the Soil Conservation Service.

farmers, at a fee that covers the cost of the equipment and labor.

The soils on some tree planting sites are too erodible to eliminate all existing cover, though enough grass must be eliminated to reduce competition in the planting row, if most species are to survive the first year and make good growth. Tree planting machines which were tried out to accomplish this result included one equipped with a lister-bottom furrow opener and a two-bottom plow; but there were shortcomings and complications in their use that led to the development of a device that opens a wide furrow in which to plant the trees. It has given such satisfactory results in the eyes of the supervisors of the 3,000-square-mile Cherry County Soil and Water Conservation District that the district had it manufactured.

The design of the furrow-opening machine takes into account the problem of slow growth made by conifers planted in furrows in the sod, although their survival was good. It removes a 15-inch strip of sod and discourages, with

an undercutting blade, another 5-inch strip on each side, thereby cutting down on competition from the grass long enough for the seedlings to root firmly and still give protection from sandblast. The furrow-opener is mounted under the midsection of a conventional tractor, and the tree planter is mounted on the rear three-point hitch, requiring but one planting operation.

In 1960 the crew and equipment planted 95,000 trees on 42 ranches in the Cherry Creek district.

Jim Kriha in the Garden County Soil and Water Conservation District is credited with having done an outstanding job of growing trees successfully in the area. Kriha has a 29-row farmstead tree windbreak and 3 wildlife plantings. Containing about 25 acres all together, they are looked upon as model plantings of their kind.

Before planting, he stubble-mulch-summer fallowed the seedbed to store moisture and reduce weeds. Then he established a sudan-grass or sorghum fall cover crop on the seedbed, both before and after planting, to reduce wind erosion and trap snow. In order to insure a good stand in his new plantings, he cultivated the trees to control weeds and save moisture, and replaced those trees that did fail to survive.

"You have to be willing to give the plantings the right care, if each individual plant is to make top progress," Kriha has found. "Fail in this and you don't get trees to grow here."

Many thrifty windbreaks—and some not so good—in the Nebraska Panhandle prove that Kriha and others using today's proven methods of planting and caring for their trees are right.

Experience has shown one or two rows of properly selected trees in field windbreaks to be as effective as wider belts in reducing wind velocity.

Hugh Bennett Professorship

North Carolina farmers are helping create a lasting memorial to a farm boy from Anson County who became one of the world's great agricultural leaders.

The memorial is the Hugh Bennett Professorship in Soils at North Carolina State College. It is dedicated to Hugh Hammond Bennett, former Chief of the Soil Conservation Service.

From May 8 through June 10, owners of ponds throughout North Carolina have been donating proceeds from fishing fees toward the professorship. From 10 to 30 well-managed, properly stocked farm ponds in each county have been designated as "Hugh Bennett Ponds." A \$1 fee is charged for fishing in these ponds.

The goal is to raise \$50,000 to \$100,000 to set up the professorship. An outstanding professor in soils at the State College will be named "Hugh Bennett Professor." He will receive an honorarium in a salary supplement from the earnings of the fund.



The Wildlife Society at its recent annual meeting in Washington, D.C., presented authors Byron L. Ashbaugh and Dr. Muriel Beuschlein of the book, **THINGS TO DO IN SCIENCE AND CONSERVATION**, with its annual Conservation Education Award in the communicative arts category. Mr. Ashbaugh is Director of Operations, Nature Centers for Young America, New York City. Dr. Beuschlein is Professor of Biology, Chicago Teachers College. (The book was reviewed in **SOIL CONSERVATION**, March 1961.)



About one-third of the earth's land surface is covered by forests.



Windbreak cedars planted on the Irlin McCray place in 1960 with combination furrow opener and planter designed by Donell Sylvester and owned by the Cherry SWCD.

PINE TREES FOR COTTON

Sound Land Use—Profit

By Dan Boone and Claude K. Compton

PINE trees are welcome money-makers and soil protectors for farmers in the Panola and Nacogdoches soil conservation districts in east Texas where cotton once was king. In both districts, many hundreds of acres of tree plantations are springing up each year, as the forerunner of a growing and permanent agriculture.

The Panola district once was covered with virgin timber, but the forest gave way to the ax, the Georgia stock, and the mule as demands for cotton increased over the years and as more forests were sacrificed for survival of the agricultural economy through the 1930's. After progressive farmers of Panola County voted their soil conservation district into being in 1941, they started a tree-planting

program. On the sound basis of using each acre of land within its capability, old wornout and eroded fields were planted to pine seedlings, with the object of creating a solid agricultural foundation through permanent conservation.

Before the landowners hardly realized it, the 10- to 12-year waiting period for starting to harvest their timber crop was over, and they began to thin their stands selectively, first harvesting the crooked, forked, or poorly topped trees wherever spacing permitted. The initial cutting averaged \$25 an acre; and the tall, clean timber left growing was valued at close to \$60 an acre.

Many of the old plantations now are in their third cutting cycle of



Four-year-old slash pine on the Ivan Ingram farm near Gary, Tex.



Pine seedlings hand planted in water furrows to conserve moisture, in the Panola SCD.

selective thinning, after 20 years. One of them is on the Ivan Ingram farm south of Carthage. His total past timber yield has been more than \$50 an acre; the growing stand is valued at \$118 an acre; and his future return is figured at more than \$10 an acre annually. Ingram has incorporated his 120 acres of various-age plantations into six compartments with his other timber acreage, and plans to harvest one compartment each year for an annual timber income.

A. R. Scharnagle, another member of the growing list of permanent timber conservationists in the Panola district, thinned his plantation selectively for the second time with similar results. He also

Note:—The authors are work unit conservationists, Soil Conservation Service, at Carthage, Tex., and Nacogdoches, Tex., respectively.

incorporates his plantations with his native timber to complete his timber operation.

In the deep-sand area in the northwest part of the district, you will find plantations of many ages scattered over an area that formerly posed a severe land-use problem and had an uncertain future. Here, too, landowners are converting an unprofitable tax liability into a retainable asset.

More than 1,000 acres of cropland is being planted to pine each year in the Nacogdoches district. A large percentage of this land is deep sand on which control of leaf-cutting ants and gophers must be provided, in addition to the grazing and wildlife protection that make up an important part of the landowners' conservation management program. Nacogdoches district cooperators must provide such protection for their woodlands if they are to realize maximum returns from their investment.

The old Nacogdoches-Rust district was one of the first to complete organization in Texas, in 1940. In the original work plan prepared by the district supervisors, it was estimated that uncontrolled grazing was practiced on two-thirds of the woodlands, and Texas Forest Service records show that more than 5,000 acres of woodland were being burned annually, compared to only 1,000 to 1,500 acres today.

One of the early woodland conservation steps taken by the Nacogdoches district was to establish a cooperative farm-forestry project on approximately 150,000 acres in its central part. Landowners in this area received high-priority assistance from all local, State, and Federal agencies working with the district in applying needed conservation measures to their woodlands.

As woodland conservation progressed, interpretation of the soils was made by the Soil Conservation Service, in terms of their suitability for growing wood crops. This information provides the district



A 15-year-old slash pine plantation on the A. R. Scharnagle farm in the Panola SCD.

cooperators with a basis for making their land-use decisions.

Today, managed grazing of farm woodlands in the southern pine belt is a part of the representative conservation plan. A typical example may be found on the Bill Scoggins farm, on which woodland grazing is utilized in combination with tame pastures. His woodland is grazed in the spring and early summer, when the woods grasses and brouse plants are at their peak in food value; but grazing is excluded after July 1, when the cattle are kept on

tame pastures. This system allows the legumes in the tame pastures to reseed, while woodland forage is being utilized at a time when there is minimum danger of grazing damage to the trees.

Fully stocked plantations of slash or loblolly pine are ready for thinning in 12 to 14 years after planting, and generally yield about 5 cords of pulpwood to the acre in the first thinning. At the present market price, this represents a return of \$25 an acre. As establishment and protection costs generally will not



A 17-year-old slash pine stand on formerly cultivated land on the Jack Boatman farm in the Nacogdoches SCD.

Woodland Clinics

For FFA-4-H Boys

By Leo L. Fisher



Slash pine plantation belonging to the city of Nacogdoches, a district co-operator, is protected by access roads serving as firebreaks.

exceed \$18.50 an acre, the landowner thus can expect to get back all of his planting cost, and some profit besides, from the first thinning of a fully-stocked stand.

The landowners of the Panola and Nacogdoches soil conservation districts are looking to a brighter future, thanks to tree planting as part of their permanent conservation programs.

More Trees For Tomorrow

More than 87 percent of the 2,137,460 acres planted to trees during the 1960 fiscal year were planted by tree farmers and other private owners, the U.S. Forest Service reports. Private landowners planted 1,837,392 acres of forest and 34,244 acres of wind-barriers. A total of 252 private, Federal, and State nurseries shipped 1,918,746,000 seedlings during the year; 34 forest industry nurseries accounted for 259,810,000 seedlings.

Thirteen States were listed as planting more than 50,000 acres each, led by Georgia with 330,196, and were responsible for 83 percent of the national total.

TOMORROW'S farm timber owners in eastern Texas are learning their conservation lessons early in annual woodland clinics for Future Farmers of America and 4-H Club boys.

Considerably more than 3,000 of these youngsters have taken part in such clinics, started in 3 soil conservation districts in 1957. Woodrow Harrell, Soil Conservation Service work unit conservationist at Gilmer, originated the idea as a solution to the need for such training in an area with approximately 50 percent of its land in woodland, a large percentage of which has lacked conservation use in the past.

The Northeast Texas Association of Soil Conservation District Supervisors, recognizing the need

for added emphasis, sponsored the first State clinic, for competition between boys in the top teams from the local districts. The 1960 State clinic was sponsored by the Texas Association of Soil Conservation District Supervisors. The number of clinics has increased each year. In 1960, 20 districts sponsored clinics, which now have spread into the southern part of the East Texas pine belt.

Objectives of the clinics include creating an awareness and understanding of the value of properly used woodland; teaching methods of developing and maintaining commercial woodlands; and familiarizing students with problems of management in woodlands.

The vocational-agriculture teachers and county agents in the



FFA and 4-H Club boys answering questions at one of the contest stations during State woodland clinic.

soil conservation districts take part from the start in planning for the clinics. First, the clinic rules and materials are explained, and a training date is scheduled with each interested group. Training, done in the field, covers techniques and explanation of planting, protection, cutting practices, timber identification and age, wildlife, timber volume and value, commercial wood products, and woodland grazing. Copies of the score sheet

Note:—The author is woodland conservationist, Soil Conservation Service, Mt. Pleasant, Tex.

and explanation sheets are furnished to teachers and county agents for their use in additional training of the boys.

In the contests among the FFA chapters and 4-H Clubs, three students comprise a team. Each FFA chapter or 4-H Club usually has five teams. The site of the contest is divided into three stations. Each team has a contestant in a group at each station, and the groups are rotated among stations. The applicable multiple-choice or completion answer is marked on

the score card at each station. Each group is allowed 15 minutes at each station, and the score sheets are turned in for grading.

The climax of the day comes with recognition of the three top-scoring teams. Awards usually consist of plaques or certificates of merit furnished by the sponsoring soil conservation district.

The clinics are helping to develop an understanding of the potential value of good woodlands and a greater appreciation of woodland as a natural resource.

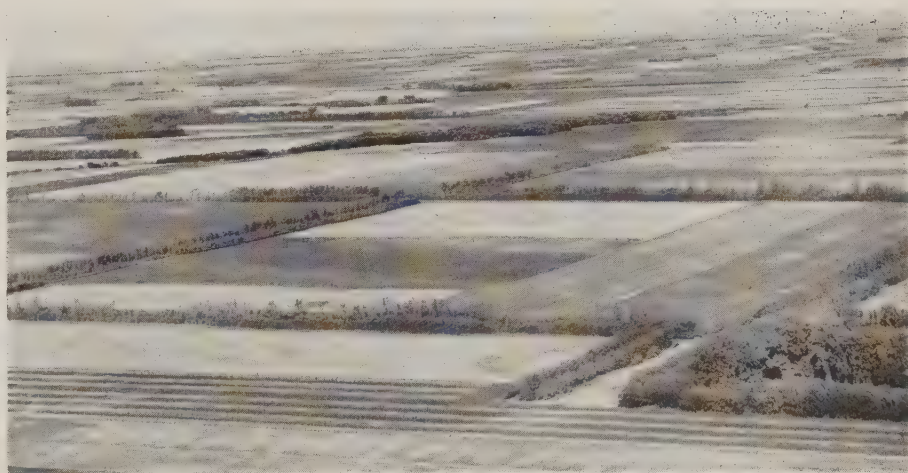
Over-the-Row Cultivation Speeds Tree Care Job

By Elmer L. Worthington

North Dakota farmers and ranchers have increased their field windbreak plantings so fast in recent years that a speedier means of cultivating the young trees had to be found to stay ahead of the job of keeping them clean of weeds.

Nearly 3,000 miles of such windbreaks for wind erosion control were planted in 1960 alone, and final tabulations were expected to show 1961 plantings exceeding that record. Additional farmstead, feedlot, and wildlife plantings also were in near-record amounts. To the end of 1960, approximately 15,250 miles of field windbreaks had been planted in North Dakota.

Over-the-row cultivation was hit upon as the answer to the speed-up problem, starting in 1958 in the Turtle Mountain and a few other soil conservation districts. By 1960, windbreak owners in an estimated two-thirds of the State's



The lands of North Dakota soil conservation district farmers are protected with more than 15,000 miles of tree windbreaks like these in the Walsh SCD.

districts practiced this type of cultivation.

Over-the-row cultivation, done at the right time with the right kind of equipment, takes the place of hand hoeing or weeding in young windbreaks, and miles of tree rows can be worked quickly and easily in this manner. Several different implements have been used, the

most popular of which is the harrowweeder equipped with 16-inch teeth.

The remodeled dump-type hayrake also does a good job, with its regular wheels replaced by smaller wheels, such as those from a sulky plow or horse mower. Other machines, like the side-delivery rake and finger weeder, also have been

Note:—The author is woodland conservationist, Soil Conservation Service, Bismarck, N. Dak.

The OLD RANCHER

TREE WINDBREAKS NEED
CARE TO THRIVE--
KEEP THE COWS OUT!



12

used successfully. In some cases, the crossbars on these implements are wrapped with burlap so the young trees will not be damaged.

Best results in over-the-row cultivation have been obtained by cultivating before the weeds are more than half an inch tall, and by working the rows often enough to keep ahead of the weed growth, or once every three weeks under normal conditions. Cultivation is discontinued by about August 15, so the trees can harden up for the winter.

This system can be used only on young trees, but it is satisfactory for all species the first year after planting. Trees with a spreading habit of growth, such as Siberian elm, dropmore elm, willows, and Russian olive, usually cannot be cultivated this way after the first year. Depending upon the implement used, trees like green ash, American elm, caragana, plum, or lilac may be cultivated in this manner for 2 to 4 years.

Over-the-row windbreak cultivation works best at fast speeds, of up to 8 miles an hour. These implements have few moving parts, so

breakdowns are minor. The machine may be pulled directly behind the tractor or offset from the tractor to the side of the row. In the latter case, a field cultivator or tandem disk may be used at the same time, to cultivate the edges and between the rows. Some operators have used a pickup or other power instead of a tractor to pull the implement over the row.

Examination of many trees cultivated in this fashion has confirmed the fact that there is insignificant or no damage to the young trees, if the implement is used properly.

The longer the teeth on the implement, the more clearance it will have.

Clean-cultivated tree rows have better survival and growth, and young windbreaks reduce wind erosion and hold snow much sooner if they are kept clean of weeds that weaken or kill the trees, are unsightly, and scatter unwanted seeds in the area. North Dakota soil conservation district cooperators accordingly are operating on the principle that "if you take care of your windbreak when it is small, it will take care of you later on."

Hunting Preserve in Ohio

By David C. Brooks

SHOOTING preserves have existed in the eastern United States for many years, but only recently have they appeared in central Ohio. Around Columbus, a population explosion in recent years brought sprawling suburbs that have taken over many farms where hunters once enjoyed their sport. Good hunting areas are becoming fewer.

The large number of hunters is becoming a problem to the farmers who own most of the good remaining hunting areas. Public lands that have been opened for hunting are overcrowded. But a well-managed commercial shooting preserve seems to satisfy the need of many hunters from the metropolitan area.

H. L. "Bud" McKinley, owner

and operator of a 223-acre farm 10 miles southwest of Columbus,



Bud McKinley in one of the duck-shooting blinds on his hunting preserve.

Note:—The author is work unit conservationist, Soil Conservation Service, Columbus, Ohio.

opened his farm as a commercial shooting preserve in 1959. It was an immediate success.

Saturdays and holidays were soon scheduled full. Many parties during the weekdays were made up of professional people and businessmen who had a half-day off. Regular accounts were obtained from corporations who bring out some of their clients each week to hunt.

Bud offered quail, partridge, or pheasants for the hunters. The greatest demand was for pheasants, and toward the latter part of the season Bud was finding it difficult to supply the demand. Almost 3,000 pheasants were shot. This was approximately 70 percent of those turned loose on the preserve.

McKinley became a cooperator of the Franklin Soil Conservation District in 1956. His basic conservation plan, with recent revisions, has been the nucleus around which he developed his shooting preserve.

His plan called for five 36-acre fields to be fenced with multiflora rose. The multiflora rose was planted by the Ohio Division of Wildlife under a working agreement it has with soil conservation districts in Ohio. A two-acre pond was constructed. The U.S. Fish and Wildlife Service furnished the fish to stock the pond from their fish hatchery at Hebron, Ohio. The open areas in his woodlot were planted to pine and spruce and the woodlot is no longer pastured.

Today the crop fields make up his five hunting areas. Corn, soybeans, small grain, and meadow are still his basic crops. Two crop fields are rotated into meadow and small grain each year. The early fall hunting is concentrated in these two areas. The other three fields are planted to alternate strips of meadow and grain about 36 feet wide. Corn is the main grain crop and most of this is harvested and sold. A few strips are planted to grain sorghum and dwarf hybrid corn, which is left for game food and cover. Some of the



McKinley in one of his wildlife food and cover strips, with dwarf corn on the left and grain sorghum on the right.

sorghum is drilled in 14-inch rows with a grain drill, and the rest is planted in 42-inch rows with a corn planter.

In the areas that are strip-cropped, the grain provides food and cover. The meadow strips, from which hay is harvested in the summer, provide easy walking for the hunter and encourage birds to fly when the dog is sent in to flush them out of the cover strips.

An addition yet to be made in each of the five hunting areas is to plant clumps of trees and shrubs. These will provide gathering points for unharvested birds so the next hunting party will have a chance to get them. Although Bud's harvest of 70 percent of the birds released is above average, he is attempting to provide a still better environment for the birds as well as a good, safe environment for hunters.

Birds are placed in the hunting area no more than an hour before a hunting party is scheduled to hunt. The number of birds placed in the area depends on the number the scheduled party wants to shoot.

For the 1960-61 season Bud constructed a $\frac{1}{4}$ -acre duck pond that is now providing duck shoot-

ing. He has 1,000 mallard ducks that fly from a ramp at the duck pens and fly over his woods past his duck blinds to the pond.

Last year Bud sold his beef breeding herd of Angus cattle. His oldest daughter is raising Arabian horses. This is now the only live-stock on the farm.

Nine months of the year Bud works for the Franklin County Board of Education as Director of Pupil Personnel. Gene Harbage assists Bud with the shooting preserve and takes over the management during weekdays when Bud is unable to be there. Gene, and several men in the neighborhood who are hired to lead the hunting parties, work a night shift in a factory so they can be available during the day.

The success of Bud's "Ramblin' Acres Shooting Preserve" is due partly to his knowledge of hunting. Bud started shooting clay targets in 1928, when he was 12 years old. He was runner-up in the North American Junior Championship Shoot at 16. He has won many other championships shooting clay targets and at pigeon shoots. He is the official gunner for numerous field trials in the Midwest.

Trees Won't Grow Just Anywhere

By Lester Fox

PHILIP H. Jones, Jr., found out early in the Christmas-tree game that trees won't grow just anywhere but have to be planted on land having the right soil and other conditions favoring them.

"You have to treat Christmas trees like any other crop and work with them the year around," Jones also explains out of his experience with 100 acres in trees on his 300-acre Christmas-tree and dairy farm

in the Fairfield County Soil Conservation District in Connecticut. "There seems to be an impression floating around that you can plant Christmas trees, wait four or five years, harvest a crop, and make a pile of easy money.

"Well, you can't do it that way any more than you can with corn, wheat, potatoes, cotton, fruit, or any other crop. Grow your Christmas trees on the right site, treat

them as you would a cultivated crop, and you'll make a profitable harvest of top quality. You'll get the best trees, and you'll get them one or two years earlier than the fellow who just plants and forgets about his tree crop."

Jones was Number 6 among the farmers who became cooperators with the Fairfield County district when it was organized in 1946, and received technical help from the Soil Conservation Service in developing and applying a coordinated soil and water conservation plan on his farm. He was elected a district supervisor in 1955, and chairman of the board beginning in 1958.

He grows no grain, but he has 80 acres in alfalfa and clover. Except for 25 acres of old woodland, the rest of the place is principally in pasture, most of it improved with plantings of top-quality grasses and clover, for his 40 milking cows and 20 head of young stock. There are 100,000 trees growing on the 100 acres of Christmas tree plantings, and he has another 100,000 trees coming along in his own nurseries elsewhere on the farm.

Jones, the fourth generation of the family to farm the same land, first learned back in 1938 about where not to try to grow trees.

"My grandfather suggested that Christmas trees would be a worthwhile crop," he recalls; "so I planted trees in that flat valley wetland area. My venture was a complete failure. The place was too wet for trees. Besides, I couldn't con-



Jones (right) and Albert E. Newby of the SCS check the soil in a block of Canadian balsam Christmas trees.

Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.



Jones tags a particularly good tree for Christmas cutting.

trol the weeds. Then in the winter the area iced over. That was the end of my trees.

"I reasoned that the site wasn't right. So I shifted to the hillsides that had been used—improperly, too—for pasture. In effect, I put the trees back where they belonged, where Nature had grown them in the first place. And in the wetland I have since planted reed canary-grass. It likes wet land. Since then, I've had no trouble as far as sites are concerned."

By 1947, District Cooperator Jones was ready to get into the Christmas tree selling business. That year, he sold 15 trees! In 1948, he sold 50. But, as a result of publicity, advertising, salesmanship, and showmanship—helped along by his wife and his mother—he has brought his sales to better than 3,000 trees a year. He also has sold as much as 5 tons of "greenery"—evergreen wreaths and pine cones—and sells enough of his nursery stock each year to cover the cost of planting from 10,000 to as high as 21,000 trees a year himself.

Jones grows the trees in his nurseries from seeds. He collects the

white spruce, white pine, and Scotch pine seed from mature trees on his own place, and buys the seeds of other species, like blue spruce from Colorado and Douglas fir from Washington. The seedlings, when they are big enough, are hand planted, 4 to 6 inches deep, because the land is too rough for machine planting.

He clears land for new seedlings with a brush saw, and follows with spraying to make sure the brush doesn't come back. He kills big "wolf" trees by girdling. He also sprays the growing trees to control diseases and insects. Jones has planted seedlings in some grassland fields, keeping the grass from smothering them by light grazing from June to September. He has

found the cows don't eat or trample the seedlings.

Jones is counting on son Terry to be the fifth generation to farm the old home place; but encroaching suburbia that has been crowding out farms in Fairfield and surrounding counties, with mounting land values and taxes, is a cause of concern. He is hopeful, however, that they can stay where they are and keep on farming.

"We like it here, and we like farming," he says. "We like to meet all those wonderful people who come to our farm every year to buy our Christmas trees and other products. We can't visualize any other kind of life in any other place that would give us so much pleasure and happiness."



A Faithful Soil Steward

CHAIRMAN Clarence Reenders of the West Ottawa (Mich.) Soil Conservation District Board of Directors is still going strong after

close to a quarter of a century of service to his district.

He was one of the original board members when the district was



Clarence Reenders

organized in 1938, and has been re-elected every three years since. He has been chairman since 1944.

The West Ottawa district, first to be formed north of the Ohio River east of the Mississippi, is on the eastern shore of Lake Michigan. Wind erosion was such a severe problem here in the 1930's that many farms were ruined for farming purposes, and roads were blocked by moving sand. The problems were greatest in the western seven townships which made up the original district.

Clarence's farm was in the middle of the blow area. He and other farmers realized that most of this land was not suitable for cropland and that trees should be planted to hold the shifting sand. His leadership helped to get early acceptance of tree planting.

Not the least of the problems was a shortage of planting stock. Because of the scarcity and poor survival of seedlings brought in, the district established its own nursery, the first in the State. The directors sold seedlings to the district cooperators at low cost, year after year, until now the sandy portion of the district is almost covered with trees. As one resident said, "Our children have grown up in a forest of our own planting."

Reenders has spread his influence in many ways. As a township supervisor and member of the county board, he saw to it that any land returned to public ownership because of tax delinquency is managed under a soil conservation plan.

He recognized early that instilling conservation in the minds of young people should be one of the chief goals of districts. Working closely with 4-H program leaders and the county superintendent of schools, he helped to arrange annual tours and conservation projects. Essay contests and work in the 13 separate school forests are part of the district's educational program. Membership on the County Agricultural Council

and his local school board put Reenders in a strategic position to help with worthwhile projects.

The veteran West Ottawa director's interests have not been restricted to his own district. His participation has been sought by other districts holding organizational meetings in surrounding counties.

Like most good soil stewards, Clarence also is active in church affairs. His wife says jokingly, "If he worked as hard in the activities of the church as he does at soil conservation, he would never have to worry."

In the building contracting business now, Reenders still maintains the home farm and is working with his sons in the operation of a 30-acre blueberry farm.

When the West Ottawa district celebrated its 20th anniversary, Reenders received an award from the Michigan State Soil Conservation Committee "in recognition of many hours of work and aggressive leadership." And last year, it likewise was something of an event when he chalked up 22 years without missing a board meeting.

—RONALD CHURCH

Community Push Gets Trees Planted

By Eudis Singleton



Former SCD Supervisor A. B. Combs (left) and son Gene measure 1 year's growth in their 5-year-old stand of white pine.

PERRY County in the eastern Kentucky coal fields region has a million more trees than it did a year ago and will have another million by the end of 1961 if everything goes as planned.

All together, landowners now have close to five million young trees growing on badly eroded, formerly "worthless" land. The county's tree-planting boom makes it the champion in the State. How did Perry County reach this position?

"It wasn't a streak of luck," says Denver Miniard, chairman of Perry County Soil Conservation District. "It took plenty of elbow grease and lots of determination."

When the Soil Conservation

Note:—The author is work unit conservationist, Soil Conservation Service, Hazard, Ky.



Typical spoil bank of a strip-mined area before being planted to trees.

Service technician reported for work in the newly organized district in 1952, his job already was cut out. Information prepared by the Service showed that 90 percent of the 219,000 acres in the district was best suited to woodland, and that of this 197,000 acres, 126,500 acres needed to be planted to trees—approximately 60 million of them.

The first step taken by the district supervisors was to contact local bankers and other business people who might be interested in helping promote the tree-planting program. As a result, 20,000 tree seedlings were planted the first year. The next year, the SCS, the County Extension Service and Agricultural Stabilization and Conservation Committee, and the Kentucky Division of Forestry helped the district supervisors plan a concentrated effort to stimulate the tree-planting program, including the contacting of individual landowners. This effort resulted in 118,000 trees' being planted.

By 1955, the number of tree seedlings planted had increased to half a million, and the program seemed to be on its way. But plantings dropped to 321,000 and 307,000 in 1956 and 1957.

"Boys, we've got to do something," said Supervisor Bill Gorman. "We need to get more people to help."

In May 1957, the district board

called a meeting of all agricultural agencies in the county, businessmen, civic clubs, the Fish and Game Club, radio, newspapers, and others to plan ways of helping it promote the 1958 tree program. A goal of 500,000 trees was set, but the community response was so enthusiastic that it was upped to 750,000 at another meeting held in November.

Weekly gatherings of group members were held to evaluate progress, correlate efforts, and revise action as needed. The county Extension agent held informational meetings, attended by numerous 4-H Club members and adults.

The SCS work unit conservationist showed to SCD cooperators out on the land the areas best suited for growing trees; provided land capability maps, and technical guides developed by the Kentucky Forestry Committee for use in determining species to be planted on various sites; and provided on-site tree-planting instructions to insure proper establishment. In special cases, technical guidance was provided by the SCS woodland conservationist. The ASC office informed landowners of payments available for tree planting.

Representatives of the Kentucky Division of Forestry personally contacted landowners in all sections of the county, took tree orders, and gave them on-site assistance in tree planting. The district forester, accompanied by the SCS work unit conservationist, got substantial orders from large landowners. The district forester also kept the group informed as to tree species available.

The Vo-Ag teacher encouraged FFA boys to plant 50,000 trees as a part of their farm project. The Vo-Ag class also helped farmers in planting trees as a cooperative effort.

Important to success of the tree



Three-year-old loblolly pine planted on severely eroded Class VII land on farm of SCD cooperator W. B. Napier.

Erosion Control in Woodland Harvest

By Robert A. Dellberg

planting was the fact that land-owners were informed of the reasons for planting, such as for erosion control and for utilizing idle land. Water management, wildlife, beautification, and other benefits of a properly planted stand of trees also were pointed out.

As a result of this coordinated effort, 770,500 trees were planted in 1958—well above the goal.

"Boys, we're on our feet again," said District Forester Walter Green. "Let's keep the ball rolling."

The ball has kept rolling, and in 1960 the total number of trees jumped by another half a million for the year's planting, to 1,283,000. And, prior to planting time, when district cooperators had ordered more than a million seedlings, it was expected that this number would be exceeded in 1961.

Dewey Daniel, banker and district cooperator, summed up this way: "Planting trees is the best insurance policy one can buy." Daniel has planted 400 acres to trees.

Land Not Farmed To Best Advantage

Canada's agricultural output could be doubled on less land than is now being farmed, in the opinion of Dr. P. C. Stobbe, director of the Canadian agriculture department's soil research institute.

"It is safe to say that at the present time too much of our land is not being used to its best advantage," he told the Senate land use committee.

Low-quality land should be converted to forests or grazing, he said.

Dr. Stobbe estimated that about 10 percent of Canada's 100 million acres of improved farmland consists of excellent agricultural soils, 85 percent is not being properly farmed, and 5 percent is just as poor in its productive capacity as land abandoned for farming.

THE Mendocino County Soil Conservation District in the redwood region of California has found several measures to be effective in coping with a high rate of erosion caused by a combination of heavy rainfall and steep slopes in harvested woodland.

District experience has shown that second-growth redwood, as well as old growth, can be logged successfully on a selective basis where the terrain permits. Here erosion control consists of simple measures, such as turnouts on skid trails and proper disposal of water from logging roads. On steeper land in pure Douglas fir stands, it sometimes is necessary to clear-cut the timber, in order to provide good conditions for regeneration of the stand. On such critical watersheds, it occasionally is necessary to apply more intensive control measures.

An example is on School House Ridge, near Covelo, a part of an 80-acre timber sale contract made for the benefit of the Covelo Indian Community. Intensive erosion-control measures were installed under supervision of the Bureau of Indian Affairs forester, with close cooperation of the loggers, to prevent damage to a watershed above a spring that supplies water for livestock. If these measures had not been used, serious soil losses and downstream flood damages would have occurred.

This tributary of the Middle Fork of the Eel River supported a dense, mature stand of pure Douglas fir. This stand was on a north-facing slope, so it is expected adjoining trees will reseed the area

Note:—The author is woodland conservationist, Soil Conservation Service, Ukiah, Calif.



This gully cut across a logging road in one storm carried away 1,000 cubic yards of soil and cost \$200 to repair. A half-hour's work with a bulldozer and installation of a culvert would have prevented it.

naturally. The only practical way to remove the mature timber was to clear-cut the area, because the slope averaged above 50 percent.

An intensive survey of the area to be logged showed that the upper and lower portions of the woodland were of such terrain and soil type that only simple and inexpensive erosion-control measures were needed. The steepest portions were on the middle of the slope, where it was evident that intensive erosion-control measures would be necessary.

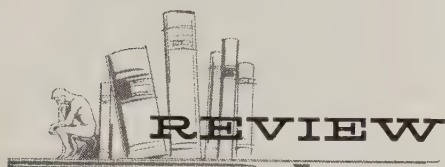
It was decided to protect the soil on the gentler terrain by lopping



Terraces across the slopes on steep mountain land control erosion after logging.

and scattering the slash and constructing berms in skid trails to divert runoff safely into the slash and brush. The heavy accumulation of slash on the steeper portions was a hindrance to reproduction and a high fire hazard, and consequently would have to be burned, leaving that area rather bare. For erosion control, level terraces across the slope were planned.

The erosion control measures were installed according to plan, including three level terraces across the steeper slope, and turnouts on all skid trails. During the past two rainy seasons, they have functioned perfectly. The cost of all the erosion control measures ran about 35¢ a thousand board-feet of the trees cut. Although it is too early for final appraisal of their value, it appears they not only are effective but also are economical enough to be practicable in helping to keep this land in its most suitable and productive use.



AMERICAN FORESTRY—SIX DECADES OF GROWTH. Edited by Henry Clepper and Arthur B. Meyer. 309 pp. 1960. Society of American Foresters: Washington, D. C. \$5.

The editors are to be congratulated on an excellent job in putting together this readable volume commemorating the 60th anniversary of the Society. They have assembled a wealth of material from an imposing group of authorities in the many related areas of forestry and land-management planning. The book is a "must" for every student in forestry, range, wildlife, and watershed management, or any other field concerned with the con-

servation of soil, water, plants, and wildlife. It likewise represents a new and ready source of reference material for professional and administrative people in these fields.

The 20 chapters deal with specific subjects, and were prepared by specialists therein. Together, they trace the growth of forestry as a national movement in the United States since its beginnings some 60 years ago, including progress made in silviculture, forest management, and other aspects of forestry. They also cover forestry research, education, and literature, and forestry activities in the Department of Agriculture and in other Federal agencies and the States, as well as industrial and world forestry.

A chapter of particular interest to soil and water conservationists is "Forestry on the Farm," of which T. B. Clair, head woodland conservationist of the Soil Conservation Service, is joint author with A. R. Spillers, head of the Forest Service's Division of Cooperative Forest Management. They trace the reversal in the approach to trees on the farm between 1900 and 1960. Then a farmer's primary concern was "how to get them out of the way of his plow," but today many landowners are growing timber as an important crop, with technical and other assistance from Federal, State, and private agencies.

The high percentages of United States farm acreage now in woodland and of farm woodland in the Nation's total timber acreage are emphasized in pointing up the advantages farmers have in growing wood crops today, though these advantages not always are completely recognized. Because such a large amount of the country's woodlands is in the hands of landowners with whom SCS people work in soil conservation districts and watersheds in providing technical help in soil, water, and plant conservation, this book is particularly recommended for their reading.

—PAUL LEMMON

Bankers Back SCD All the way

Bankers in the Denton-Wise Soil Conservation District in north-central Texas believe soil and water conservation pays—and back their belief with cold cash.

Every year since 1952, seven banks in the district have financed the district supervisors' trips to both State and National conventions of soil conservation districts. During that time, the supervisors have traveled thousands of miles—all expenses paid—keeping up to date with latest developments in soil and water conservation methods used throughout the Nation.

The district board annually holds an appreciation dinner to honor the bankers for their moral and financial support and their many other contributions in soil and water conservation activities. Bankers and their wives, newspaper editors, radio and TV reporters, and local Soil Conservation Service personnel and their wives attend.

Have You Seen?...

● *Careers in Conservation*, an informative booklet on employment opportunities in the different fields of soil and water conservation, both in and outside of government, issued by the Soil Conservation Society of America.

● *Help Keep Our Land Beautiful*, latest in the series of educational booklets published by the Soil Conservation Society of America, designed to tell the story of conservation to everyone. The 16-page "comic" booklet tells of an American family's motor trip through the United States and of its concern about the treatment of our soil and water resources. Others available in the series are: *The Wonder of Water*; *The Story of Land*; *Dennis the Menace and Dirt*; and *Down the River*.

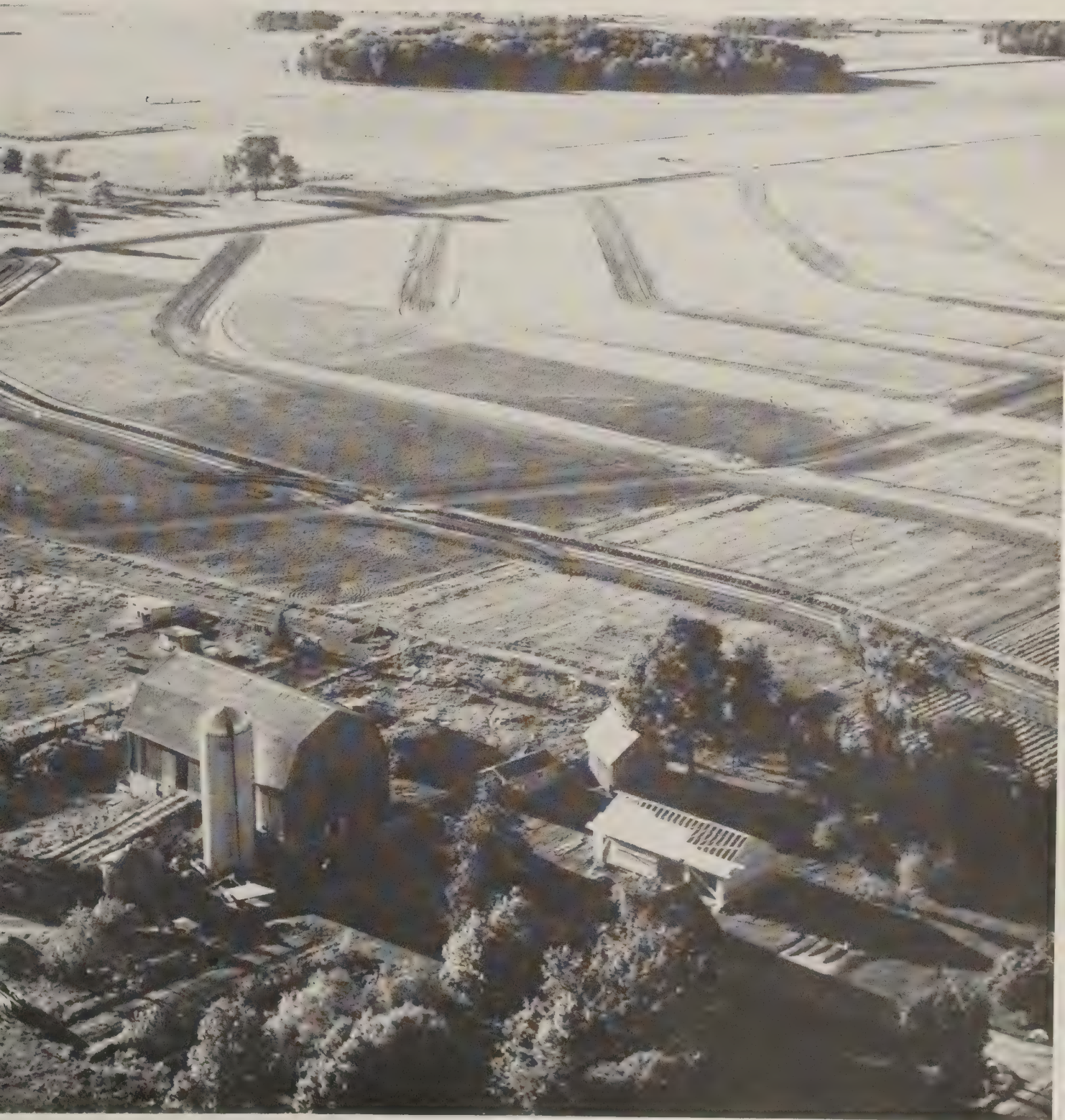
If your address changes, please notify us of your complete new address, including zone or RFD number, and include old address with our code number as shown above.



Secretary of Agriculture Orville L. Freeman signs a memorandum of understanding in his office with the Gerlach (Nevada) Soil Conservation District, as the basis of Department of Agriculture cooperation in carrying out the 1,521,600-acre district's plan for soil and water conservation work and improved land use by ranchers. Present at the signing were (left to right): Administrator Donald A. Williams of the Soil Conservation Service, Congressman Walter S. Baring and Senator Alan Bible of Nevada, Secretary Freeman, and Senator Howard Cannon of Nevada. "I consider the advancement of the soil conservation district movement as a most significant development in America because of the democratic philosophy which has been embodied in its organization," Secretary Freeman said.

JULY 1961

Soil Conservation





Growth Through Agricultural Progress

"In a farm horizontally and deeply ploughed, scarcely an ounce of soil is now carried off from it. In point of beauty nothing can exceed that of the waving lines and rows winding along the face of the hills and valleys."

—THOMAS JEFFERSON



COVER PICTURE.—Forty acres of completed parallel terraces before field rearrangement, on the farm of Lawrence Leick, Stratford, Wis., in the Marathon SCD.

CONTENTS

PAGE	
267	Engineering Measures in Conservation <i>By Donald A. Williams</i>
268	A New Look For Terraced Fields <i>By James J. Coyle</i>
270	Dam Overhauled By "Arctic" Engineering <i>By Harold W. Bradford and Truman G. Spannagel</i>
272	Geologic Studies Pay Off <i>By A. F. Geiger</i>
274	Grassed Waterways Boon to Kansas Farm <i>By George R. Smith and Grant Woodward</i>
276	Watershed Structures Call For Engineering <i>By Eugene C. Buie and Carroll A. Reese</i>
278	New Water Management System <i>By Larkin B. Agnew</i>
280	St. Anthony Falls Hydraulic Laboratory <i>By Fred W. Blaisdell</i>
283	Terrace Club Gets Results <i>By Martin Max Hawk</i>
284	Soil Mechanics in Soil and Water Conservation <i>By Rey S. Decker</i>
285	Hydrologists Keep Track of the Water <i>By R. G. Andrews</i>
286	Bulbs Can't Stand Wet Feet <i>By Andrew Linn</i>
288	Book Review

Soil Conservation

ORVILLE L. FREEMAN
Secretary of Agriculture

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

SOIL CONSERVATION is the official organ of the Soil Conservation Service, published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication was approved by the Bureau of the Budget, June 26, 1958.

FRANK B. HARPER, Editor

15 CENTS PER COPY

\$1.50 PER YEAR

FOREIGN—\$2.25 PER YEAR

25 percent discount on orders of 100 or more mailed to one address.

All orders for paid subscriptions go to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Engineering Measures

In Farm and Watershed Conservation

By Donald A. Williams

STRUCTURES and earthmoving are indispensable in the combinations of soil and water conservation measures used in treating the country's farms and watersheds.

Conservation planning and treatment calls for employment of a combination, also, of technical skills, including those concerned with the design and building of carefully engineered structures for erosion control and water management. Used in conjunction with conservation vegetative and tillage practices, they include everything from water-controlling terraces to farm ponds and improved irrigation systems on croplands, to flood prevention structures and other works of improvement in small watersheds.

Whether such engineering measures are installed on farm fields or range pastures, on watercourses or elsewhere, they fit together with conservation cropping, woodland, and wildlife practices. They have been developed through research and experience during the last 30 years for bringing about sound land use through erosion control, soil improvement, and agricultural water management. Structures and related measures, designed to the most economical proportions practicable, are included in conservation farm or watershed plans only when the need for them is established. They are used for many purposes, ranging from checking hillside gullies to floodwater retention in small streams.

It is because of their complexity and diversity that the solution of most soil and water conservation

problems calls for combined knowledge and experience in soils, engineering, agronomy, range, forestry, biology, geology, and economics. This approach to these problems has demonstrated its soundness wherever they are encountered, whether it is in providing technical aid to farmers and ranchers in their soil conservation districts, through the Agricultural Conservation Program or the Great Plains Conservation Program, or to community organizations in watershed protection projects.

All of these activities in which the Soil Conservation Service has assigned responsibilities require substantial engineering services—in major proportions where irrigation, drainage improvements, reservoirs, or other water conservation measures are stressed. Perhaps the most significant part of the national action program of soil and water conservation from the engineering standpoint is small-watershed development—already totaling between 600 and 700 projects being planned or in construction—because it involves more dams and other structural work for flood prevention.

Conservation engineering skills run the gamut from cartography to construction, from geology to streamflow forecasting from cooperative snow surveys, in which Service engineers have pioneered in the West. They include irrigation, drainage, flood prevention, and erosion-control engineering, and soil mechanics. For many years, also, the Service's agricultural engineers and other technicians have joined machinery manufacturers,

farmers, and research specialists in search of tillage, earthmoving, planting, and other equipment adapted to conservation farming and construction needs.

Conservation measures that have been installed by soil conservation district cooperators and other farmers reflect the major proportions of the engineering technologies involved. As estimated to date, they include: More than $11\frac{1}{3}$ million miles of terraces and diversions; 1,100,000 farm ponds; approximately 1 million acres of grassed waterways; 35,000 small irrigation reservoirs and 55,000 sprinkler-irrigation systems; improved water application on nearly $11\frac{1}{2}$ million acres; proper irrigation-water use on $4\frac{1}{4}$ million acres; land leveling on more than 6 million acres, and land grading and smoothing on nearly 3 million acres; water management and control practices on almost 25 million acres; and wetland development for wildlife on about a quarter of a million acres.

Installations in watershed and flood prevention projects, meanwhile, include approximately 2,000 floodwater-retarding structures and 1,650 miles of stream-channel improvement work estimated as completed July 1, 1961. Some 20 group irrigation and drainage improvement jobs include additional canal and ditch construction, stream-channel improvement, and other measures.

Techniques continue to be improved by the Service in all aspects of conservation engineering, better to meet the growing workload in this field.

A New Look For Terraced Fields

By James J. Coyle

INCREASING numbers of farmers are finding they can protect their fields by using a new parallel terrace layout that causes them little difficulty in operating their farm machinery.

Few farmers question the good that terraces do in reducing erosion by controlling the flow of water down sloping, cultivated fields. But some landowners have hesitated to install them, because of the difficulty of farming some conventionally terraced fields with the large equipment now commonly used.

This difficulty comes about when the area between two terraces is wider at some points than at others, resulting in point rows that do not extend the full length of the terraces. To work these rows, the farmer must turn his equipment in the planted area. This was not a major problem in the days of horse-and-mule farming, but turning with large tractor equipment not only takes time but also causes damage to crops when it must be done in the planted area.

There are no point rows when the distance between two terraces is uniform throughout their entire length. Each row extends the full length of the parallel terrace, and all turning can be done at the ends outside the planted area.

It seldom is possible, however, to have all terraces in a field parallel. Normally, the parallel terraces are in groups of 2 to 10 or more, with the odd-shaped terrace intervals limited to the areas between groups of terraces. On most fields, this means that point rows will occur in only one or two places



Part of 100 acres of parallel terracing and stripcropping on Tracy Garrick farm, Cope, S. C.

instead of between all terraces. The parts of these odd-shaped areas where point rows would occur can be planted to permanent vegetation if the farmer desires.

There are a few ground rules he will need to follow if he wants terraced fields with the smallest possible number of point rows:

All old terraces, turn rows, headlands, and other surface irregularities should be smoothed down. This is done best with bulldozer or scraper, so the soil can be placed in low spots to even up the field surface.

All swales and draws that are a part of the surface drainage pattern for the field will need to be used as waterways. This may call for more waterways than the farmer is accustomed to, but they are absolutely necessary. Good terrace alinement cannot be obtained if terraces are run across these natural drainage swales. The waterways are easy to cross with present-day power-lift, mounted equipment.

In some fields there are areas of steep, rough, or badly eroded land that must be taken out of cultivation in order to have a good terrace system. These areas can be pointed out by the technician as he runs the lines.

The farmer who is willing to abide by these ground rules is rewarded with terrace systems that are very little more trouble to work with large equipment than an unterraced field would be. In addition, he has the satisfaction of knowing that his fields are protected against erosion.

Georgia farmers are among those who have turned extensively to parallel terracing. On the Carl Bowen farm in Dooly County, for example, the old terraces had been run from field boundary to field boundary, crossing several natural swales. All areas between terraces were irregular in width, and a high percentage of the field area was in point rows. Bowen's old terraces were smoothed down and a new system installed, using the

Note:—The author is agricultural engineer, Soil Conservation Service, Washington, D. C.

natural swales as vegetated waterways. This layout eliminated all point rows except in three small areas.

Ralph Burton is another Dooly County farmer who had a field of old terraces removed and new ones installed. With the old terrace system, a large part of the field was in point rows. In the new system, most of the terraces are parallel, and there are only two small areas in point rows.

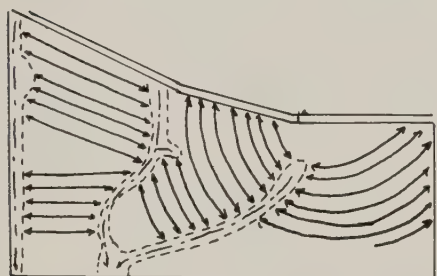
Since the first work of this type in Georgia was done in 1957, approximately 4,000 miles of parallel terraces have been built. Enthusiastic Georgia farmers have acquired several hundred pieces of special equipment to help them install and maintain their improved terrace systems, including land levelers, reversible plows, and large and small scrapers. Equipment companies have held some 40 demonstrations on terracing, land smoothing, and waterway construction.

farm near Silver City in Mills County, using the cut-and-fill procedure. If the terraces had been constructed in the conventional manner, about 28 percent of his entire field would have been occupied by point rows; whereas the point-row area was reduced to approximately 7 percent of the field area by cutting and filling to get better alinement of the terraces. The same technique for building a system of graded terraces on the Fred Link farm near Farrar eliminated nearly all point rows for him.

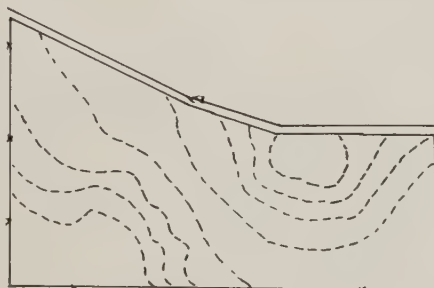
Farmers in Alabama have made the greatest progress in adopting the new method of terracing. Since the first such installation in 1952, approximately 12,000 miles have been constructed. Olaff Ivey of Houston County was the first farmer in the State to build parallel terraces. His comments are typical of those voiced by farmers wherever such terrace systems have been



(Upper) Shaded areas would be in point rows in old terrace layout. (Lower) Map of same Eural Anderson field in Mills County, Iowa, showing point rows reduced by land smoothing.



Old terrace pattern on Carl Bowen field in Dooly County, Ga.



Re-terraced field after old terraces were smoothed down.

Some of the first work on improved terrace alinement was done by Soil Conservation Service technicians in Iowa as early as 1949. Since that time, more than 2,000 miles have been built by Iowa farmers. Part of the work in this State has been on fields with very irregular topography. This has resulted in the need for considerable cutting and filling along the terrace line, to keep the terrace grades within allowable limits that would not cause erosion of the terrace channel.

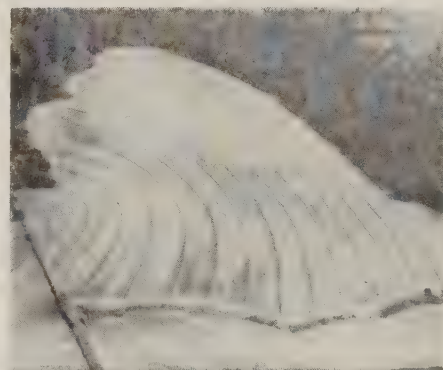
A system of level terraces was installed on the Eural Anderson

installed: "After running my cotton picker on parallel-terraced fields, I feel like I am ruined when I get on fields not having terraces parallel. When you turn the cotton picker around in the field to pick up short rows, you strip off many limbs and bolls and mash down stalks, and the unopened bolls rot."

J. S. Bradshaw of Cottonwood had this to say: "This is the easiest crop I have made since I have been on this farm. I can run out on that waterway and turn around without stopping. My parallel terraces and waterways are not for sale."

And C. B. Crowley of Ashford agreed that "It is easier to operate my machinery on fields where I have parallel terraces. I also save time in planting and harvesting."

South Carolina farmers also are going in for improved terrace alinement. Something like 1,000 miles of the newly designed terraces have been built since 1955—more than 250 miles in the past year alone. Many new peach orchards



The only point rows in Will McSwean's parallel-terraced field near Ozark, Ala., are in left background. Terraces spill into waterways and grassed border strips.

in South Carolina have been planted on fields with newly constructed parallel terraces. In orchard layout, the waterways are made extra wide, so that harvesting equipment can travel along the outer edges without damaging the center position where water will flow. South Carolina farmers also have found that parallel terracing and stripcropping work well together. Farmers in many other States are making worthwhile progress in parallel terracing with the assistance of Soil Conservation Service technicians made available through their soil conservation districts. Not all problems have been solved; but it has been found that terrace alinement can be greatly improved in practically all cases by planning the terrace system to fit the natural drainage pattern of the land, and by following the few "ground rules."

Soil Compaction Reduces Yields

Excess soil compaction cuts crop yields, sometimes as much as 54 percent, as shown by findings in a two-year study of the value of minimum tillage at the University of Minnesota.

Soil surfaces were packed with a heavily loaded truck, and the plow layer with a special weighted wheel. The resulting compaction produced soils with less air space and harder penetrability, much like that which occurs from overuse of field machinery.

In field trials with the experimentally packed soil, potato yields dropped 54 percent. Packing also reduced wheat and sugarbeet yields 13 percent and cut corn yields 7.5 percent.

When both surface soil and plow layer were packed, corn yields dropped 14.5 percent.



Farm fires caused losses estimated at \$165 million during 1960, says the Agricultural Research Service.

DAM OVERHAULED

By "Arctic" Engineering

By Harold W. Bradford and Truman G. Spannagel

FARMERS served by the Montezuma Valley Irrigation Company in southwestern Colorado have enjoyed a far more stable supply of water for three years now because they modernized their irrigation system by rehabilitating their more than 50-year-old Narraguinnep Reservoir.

Overhaul of this irrigation old-timer, along with the entire system, was accomplished through the Dolores Soil Conservation District with technical help of the Soil Conservation Service. It was a mid-winter achievement calling for tricks worthy of arctic engineering techniques.

Most of the farming in this part of Colorado, famed for its ancient Mesa Verde cliff dwellings, is at

an altitude of between 6,000 and 7,000 feet. The growing season is short, the winters usually are long and cold, and most of the moisture comes in winter snows. Irrigation is vastly important to the area's economy.

Irrigation water for most of the county's feed and grain crops comes from the Dolores River, which rises in the rugged, snow-cowled San Juans to the north and east. It reaches the farmlands by way of the Montezuma Valley Irrigation Company's system of canals and ditches. From the beginning of irrigation in the valley, a more stable flow has been a pressing need. In spring, fast snowmelt has sent torrents downstream. In summer, when crops still needed



Nearly 20 inches of snow failed to halt construction of the Narraguinnep dam. Equipment ready to pour concrete for a conduit section.

water, there nearly always has been a shortage.

The company built Narraguinnep Reservoir in 1907, with 9,250 acre-feet of storage. It also built Totten Reservoir about the same time, but it was unsatisfactory and was abandoned. A reservoir the company built in 1937 on Groundhop Creek 35 miles upstream also was largely a disappointment, because its 21,000 acre-foot capacity rarely has been more than half-filled; but it does serve areas water flow from Narraguinnep can't reach.

Narraguinnep itself gave trouble



The reservoir is nearly full a few weeks after completion of the dam.



Crane ready to make the third pour on well tower for the dam.

almost from the start. There were seeps and occasional sloughing of the upstream surface of the dam. Finally, a big seep developed, and the owners were worried about the dam's safety.

An agreement with the Dolores district outlined all phases of action needed to develop a modern irrigation system furnishing water to approximately 35,000 acres of land owned by 700 farmers, a large percentage of whom have basic conservation farm plans. The measures they are using include

Note:—The authors are, respectively, work unit conservationist Cortez, Colo., and engineer, Glenwood Springs, Colo., both of the Soil Conservation Service.

land leveling, new irrigation structures, conservation cropping systems, adequate crop-residue use, fertility maintenance, and efficient use of irrigation water.

Studies by Soil Conservation Service men assigned to provide technical help to the district showed that the capacity of the Narraguinnep Reservoir could be increased feasibly by 10,000 acre-feet, or to a 19,000 acre-foot total, despite the fact there were such problems to deal with as layers of porous sandstone and a major fault in the geologic formations. Studies of site conditions by Service geologists and soil scientists supplied the information needed by the engineers in design and construction.

The SCS engineers and the irrigation company agreed that, in order to get the increased capacity, the reservoir level would have to be raised 20 feet. To do this would require three dikes, in addition to the added height of the dam. The engineers decided to relocate the Lone Pine Lateral on the north and northwest shore. Three new drop structures were designed to stabilize the canal grade. This work was done by the company maintenance crew.

The Colorado Highway Department wanted to use the dam as part of a State highway asphalt link,

meaning a wider crest on the dam than otherwise would have been needed, at an added cost of \$29,362, borne by the highway department.

A contractor with wide experience in high-altitude, wintertime construction went to work in November 1956. He had 120 working days in which to complete the nearly half-a-million-dollar job, before the start of the irrigation season.

The winter began with unusual cold, and heavy snows followed—18 inches in one storm. Because frozen earth could not be used in the embankment, the contractor put on around-the-clock shifts. By using various devices to combat frost and snow, he succeeded in completing the job on June 17, 1957, at a total cost of \$495,317, or a cost of roughly \$50 an acre-foot to the irrigation company for its added water capacity.

Snow had to be hauled from the embankments after each storm, to prevent any variation from the desired moisture content of the material. Material that became too moist was removed, and dried or mixed with dry material and replaced.

The old conduit tunnel was straightened, enlarged, and extended with reinforced concrete, each section being covered with

plastic sheets to keep it warm during low-temperature periods.

Finally, sand-and-gravel embankment "blankets" were ripped with rock.

With the other improvements they have been making as co-operators with their soil conservation district, Montezuma Valley farmers are obtaining profitable returns from more efficient farming operations, through the conservation use of both their soil and their water resources.

Fallout Shelters For Farm Animals

How can a farmer protect his animals from radioactive contamination in case of nuclear attack? Henry B. Thompson, test officer for the Maryland Civil Defense Agency, says animals can survive as well as farmers if adequate precautions are taken.

A special shelter for animals is a good idea, he says. Several feet of hay in an overhead loft or stacked around the sides of a barn would offer protection. So would a barn basement, particularly if earth fill is placed against the exposed wall. One farmer, Thompson notes, has built a shelter around a well—a better source of water than a stream, pond, or lake in case of fallout.

Some animals, notably donkeys, horses, and hogs, resist fallout as well as humans and better than other animals. Poultry survives very well.

Milk from cows exposed to radiation can be used safely if the cow has not taken contaminated food or water, Thompson says. Even contaminated milk can be saved, by converting it into butter and cheese and storing the products until the radioactivity has diminished.

The risk of serious contamination in eggs is relatively small, and would have to be accepted when there was a shortage of food. In cases of doubt, the eggs should be preserved and stored.

Geologic Studies Pay Off In Conservation

By A. F. Geiger

BASIC geologic investigations are paying their way many times over in soil and water conservation structural and related developments over the country.

Those benefiting include individual landowners, irrigation and other groups, and communities and governments in small-watershed protection and flood prevention projects. These projects, with their dams and other works, have stepped up the need for such investigations sharply in the last few years.

In the comprehensive program of soil and water conservation for which the Soil Conservation Service provides technical aid, its geologists are primarily concerned with three phases of geology. One is engineering geology, the study and subsurface exploration of foundations for structures. Another is sedimentation, or the study of erosion and erosional processes, and entrainment, transportation, and deposition of sediment. The main concern here is the acceleration of these processes which has resulted from man's activities. The third is groundwater geology, or the study of the movement of water underground and its availability for use.

There are many examples of how geologic studies have resulted in significant savings. Take, for instance, one of the Public Law 566 watershed projects in western Minnesota:

During planning, geologic investigations of a proposed damsite revealed poor subsurface conditions. Remedial measures necessary to make it a safe site would have

cost an estimated \$132,000. Further investigations, however, disclosed another site about half a mile downstream with much better subsurface conditions. Some remedial measures still were necessary, but it was found that they could be completed at an estimated cost of only \$32,000. This difference represented a direct savings of \$100,000 in eventual construction costs in return for the expenditure of but a few hundred dollars for geologic investigations.

Such studies helped assure a good irrigation well on the ranch of R. D. Hadley near Carlin, Nev., in the Humboldt River Soil Conservation District. His ranch is in an area where quite a number of dry holes and poor wells have been drilled. At Hadley's request, SCS geologists explored the surface geology of the area. This study indicated that the alluvial deposits of Maggie Creek and the underlying lava should be well supplied with water by seepage from intermittent flows in the creek. The problem then became one of locating an area where the alluvium was permeable enough and extensive enough, or where the lava flows were cracked and fractured enough, to yield large quantities of water.

To this end, four small-diameter test holes were drilled and logged. After the logs were studied, it was recommended that the large-diameter irrigation well be drilled near the test hole showing the thickest section of permeable materials. The completed well produces 1,330 gallons a minute, or enough good-quality water to irrigate 130 acres.

Note:—The author is geologist, Soil Conservation Service, Beltsville, Md.

This acreage produces enough feed for Hadley's breeding herd of cows, the core of his livestock business.

"During the three years this well has pumped," Hadley said, "I have raised 600 tons of hay I wouldn't have had otherwise, worth at least \$15,000. In addition, I have harvested approximately 750 animal unit months of aftermath worth approximately \$3,750. This gives a gross return of \$18,750 for the three years. To me this is an excellent return on my investment."

During the development of the watershed work plan for Camp Rice Arroyo near El Paso, Tex., studies of sediment in the stream channel and of the stream gradient below the proposed floodwater-retarding structure indicated that serious erosion would occur. Sediment deposition would cause severe damage to road and railroad facilities and to valuable cropland, and erosion possibly would endanger the structure itself. A grade-stabilization structure was placed in the channel below the floodwater-retarding structure and is providing protection against these damages.

In 1957, the Stemilt Irrigation District at Wenatchee, Wash., needed more irrigation water, because of high leakage losses from existing reservoirs, and proposed to build a new dam on Stemilt Creek. After a preliminary investigation of the proposed site, the SCS geologist recommended core drilling to explore the foundation further. The detailed exploration revealed foundation conditions which made impossible the construction of an economically feasible dam. As no other damsites were available, it was recommended that two existing dams be investigated to see if it would be feasible to repair and possibly raise them.

The leakage areas of these reservoirs were located, and the recommended measures reduced the leakage from one reservoir by 90 percent and from the other by 70 to 80 percent. Further repair will cut

down the leakage in the latter reservoir even more. The geologic investigations and repair work cost between \$30,000 and \$40,000 less than the proposed new reservoir would have cost, and more water is being stored by the repaired reser-



Drilling the Hadley well.

voirs than the proposed reservoir would have been able to store.

The city of San Antonio, Tex., and the farms in the vicinity obtain their water from the underground water reservoir of the Edwards limestone plateau. The water



The well in operation.

supply in the reservoir is being depleted at an alarming rate, and severe water shortages are predictable within the next 20 or 30 years unless something is done. Geologic investigations in the Salado Creek watershed, just north of the city, have revealed an extensive area where the limestone is broken by a series of faults and cracks. This is an area where water from the surface has easy access to the un-

derground reservoir. However, much of the surface runoff in this area comes in the form of flash floods, which carry most of the water past the fault zone before it has a chance to filter down to the aquifers.

The watershed is being planned as a flood prevention and watershed protection project. Some of the proposed floodwater-retarding reservoirs are to be built so they will back water over the fault zone, where it can flow directly into the aquifer. Several others will be built above the fault zone so that floodwater, being released slowly from the reservoirs, will have a better chance to infiltrate as it passes the fault zone.

In this way, an additional 3,490 acre-feet of water will be put into the ground each year. This water has a value of about \$14 an acre-foot. About 40 percent of the additional water will be used by the city of San Antonio, and the rest will be available for irrigation and stock water.

Highly valuable agricultural land in the Calleguas Creek watershed in Ventura County, Calif., has suffered severe damage from deposition of infertile sediment from the creek. Geologic investigations determined that the source of 80 percent of the sediment was channel scour and bank erosion on the main channel of Calleguas Creek above the damage area. The remaining 20 percent came from gully and sheet erosion in the upper watershed. The eroding portion of the channel was treated by putting in a series of concrete stabilizers, which control the grade of the channel and keep water velocities down to a non-eroding rate. As a result, the sediment problem has essentially been alleviated.

Census figures show that from 1950 to 1960 there were a total of 1,291,000 farms in the U. S. that produced over \$5,000 gross sales in farm produce.

Grassed Waterways Boon to Kansas Farm

By George R. Smith and Grant Woodward

EUGENE O'Trimble thinks his grassed waterways give him more return acre for acre than any other land on the farm. And with good reason, because he and his sons have been producing from 100 to 125 bales of hay to the acre, plus about 500 pounds of brome-grass seed, a year.

This high return from his waterways doesn't take into account ridding his fields of the land-chewing, unsightly gullies that they have replaced, nor does it include the abundance of good water which now serves a farmstead that too often was without enough water before.

The O'Trimble farm setup is a beef-wheat-corn-milo-brome-grass operation in the Jefferson County Soil Conservation District in north-eastern Kansas. O'Trimble, a member of the district board of supervisors, grew up on the place. The layout of his boyhood has been expanded until the O'Trimbles now own 1,100 acres of productive, conservation-treated farm and pasture land. One of his sons, Eugene, Jr., and his family live on part of the farm; and a second son, Robert, also takes part in the farming operations.

The O'Trimbles added the newest 160-acre piece to the farm only 3 years ago. It was real problem land. Numerous gullies were gnawing up the slope toward the farm buildings. Two major gullies had nearly reached the property lines, making the fields virtually inaccessible to farming equipment; and the fields had grown up to weeds and elms, with a scattering of lespedeza. Referring to the sad condition that the farm had been in,

veteran conservation farmer O'Trimble said:

"It's a shame that everyone doesn't use good conservation farming practices. These two larger gullies had been allowed to grow until they were 10 to 12 feet deep. They were full of brush and timber. It was a rough-looking mess."

His formula for taking care of such gullied land boils down to this: "Get a contractor who has the right machinery and who knows his business. Get the Soil Conservation Service boys to plan and stake out the job, and keep an eye on things as they progress." Eugene and his sons do the smaller construction jobs themselves, but the larger jobs are contracted out to local soil conservation contractors.

Controlling the big gullies called for two large waterways and an erosion-control dam. The water-

ways were designed by Soil Conservation Service engineers to carry the estimated peak runoff from a 10-year-frequency storm at a velocity of 2 cubic feet per second. Broad, gently sloping, easy-to-cross waterways, accurately engineered to dispose of excess water without harm to the land, replaced the steep-sided, V-shaped gullies that had made the farm unprofitable for cultivation.

The dam is a 5,400-yard earth fill, with a 24-inch pipe to drop overtopping water to the stable natural channel below the dam. The pipe spillway was designed to carry a 5-year-frequency storm runoff, taking into account demands which might be placed upon the structure by rainstorms of a 25-year frequency. Permanent sod protection for an emergency spillway is a built-in feature.



O'Trimble, Sr., admires brome-grass-covered waterway, once a deep gully, in April after record March rainfall failed to damage it.

Note:—The authors are, respectively, State engineer, Salina, Kans., and agricultural engineer, Lincoln, Nebr., both of the Soil Conservation Service.



The O'Trimbles of Williamsen, Kans., left to right: Robert, Eugene, Jr., and Eugene, Sr.

From the dam, water is pumped through a settling tank, a filtering tank, a chlorinator, and a water softener to the faucets serving the younger O'Trimble family. Although this added dividend was not foreseen when the gully-control work began, there now is a dependable supply of good-quality water from the reservoir created by the erosion-control dam. The flow from a small spring keeps the water level comparatively stable, within a foot or two of the drawdown pipe. The well at the farmhouse used to supply only about two bucketsful of water and then stop. Terracing, the grassed waterways, and contour cultivation on the O'Trimble land combine in this and other ways to give the operator efficient use of the moisture that comes in rain and snow.

O'Trimble has some practical advice on how to keep shaped waterways from becoming gullies again: "Don't skimp any place on this job. A waterway with a gully down the middle puts you right back where you started. Shape a gully in the early fall. In this country, plant brome grass—we broadcast it. Overseed it lightly with wheat for a nurse crop. Then use enough fertilizer for the job."

He uses about 100 pounds of nitrogen a year on his waterways. "Brome grass, like corn, will stand about all the fertilizing you give it," O'Trimble has found. "Give

this grass here another year and nothing will hurt it."

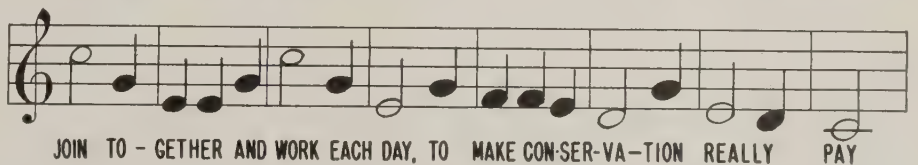
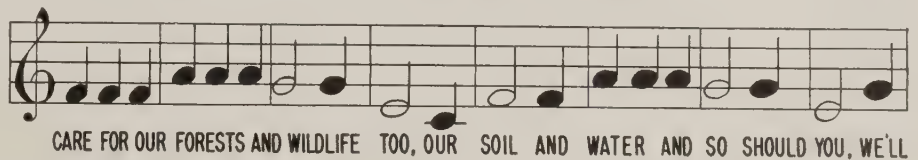
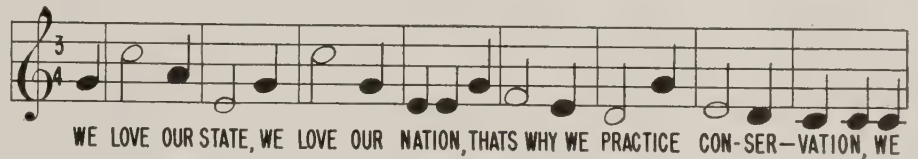
All natural drains on the O'Trimble place have been shaped into waterways. This system has made possible the use of shorter terrace lines, better terrace alignment, and greater convenience in farming operations. The drains are highly productive of hay, grass, and forage when used as grassed waterways, because of the fertility of the soil and the added moisture they retain. Untreated, these same natural drains would have continued to be a hazard as raw gullies, being a source of sediment from erosion, adding to the difficulty of farming operations, and providing a source of concentration of weeds

and other unwanted growth.

The grassed waterways are not the only measure that makes O'Trimble sure that soil conservation pays. For example, the red clover he uses to build up his land also furnishes hay for livestock, and the past two years he has netted \$40 to \$50 an acre from seed. He also figures that the soil and water conservation program on the newly acquired 160-acre tract has added several thousand dollars to its value.

"Besides," O'Trimble says, "the money value isn't everything. It's worth a lot just to stand and look at, the way it is now. Grassed waterways are a lot more attractive than raw gullies."

OUR CONSERVATION SONG



SCHOOLCHILDREN in South Carolina now are learning about conservation with the aid of a song. It was written and set to music by Mrs. Theo P. Hartin, principal of the Arden and John P. Thomas elementary schools in Columbia, S. C.

Mrs. Hartin has taught conservation of soil, water, woodlands, and wildlife to elementary school children for a number of years, and has helped with a conservation workshop at the University of

South Carolina for several years. She also is a member of the South Carolina Advisory Council on Conservation Education.

In 1957, Mrs. Hartin was presented the "Woodmen of the World Conservation Award" for her work in teaching conservation of natural resources to children. She says, "I have proved to myself that conservation of natural resources education can be correlated with subjects taught in elementary grades."

Watershed Structures Call For

Major Engineering Planning

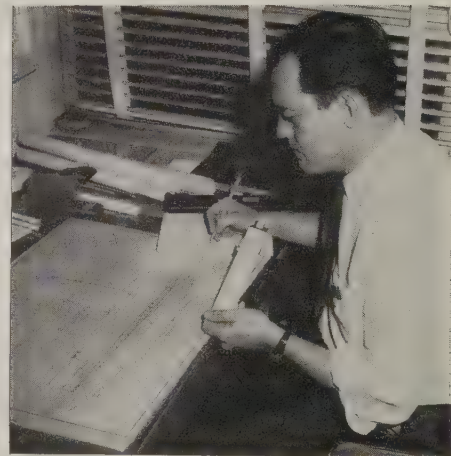
By Eugene C. Buie and Carroll A. Reese

MADISON County's South River watershed in Georgia provides a typical example of the problems which soil and water conservation engineers and their fellow technicians come up against throughout the Southeast and the rest of the country in planning flood-prevention dams and other water-management structures in creek-size watersheds.

These structural works of improvement, in nearly all watershed protection and flood prevention projects, are essential in complementing conservation land use measures applied by landowners on watershed fields, pastures, and woodlands. All of these measures together call for the combined ef-

forts of conservation engineers, soil scientists, agronomists, range conservationists, plant materials specialists, woodland conservationists, biologists, and others, as local situations may dictate.

The Broad River Soil Conservation District and Madison County officials in May 1955 applied to the Secretary of Agriculture for Federal technical and financial help in developing a small-watershed project as provided in the Watershed Protection and Flood Prevention Act. Immediately after the State Soil Conservation Committee assigned the watershed priority for planning early in 1960, a preliminary investigation was made by the Soil Conservation Service,



SCS Design Engineer Hal Pridgeon completing floodwater-retarding structure design.

which has the responsibility of carrying out the Department of Agriculture's assistance in watershed projects.

This investigation was to determine whether the project was feasible. It was necessary to find out whether the flooding and other problems could be solved by watershed treatment within the scope of the Act, and whether the benefits to the landowners and the sponsoring local community would be enough greater than the cost of the project improvements to justify going ahead.

The South River project's experience also illustrates how careful, step-by-step investigation and sound planning develop progressively more accurate and dependable information on which to base



Principal spillway of floodwater-retarding structure under construction.

Note:—The authors are, respectively, watershed planning specialist and design and construction engineer, Soil Conservation Service, Spartanburg, S. C.

unal project development. For example:

In making the preliminary investigation, 51 potential floodwater-retarding structure sites were considered. The planning engineer determined that existing stream channels would have to be enlarged. The engineer, the economist, and the hydrologist, working as a team, identified the damage areas and charted a structural program designed to reduce damage and provide an agreed-to level of protection to the damage areas. The watershed was authorized for planning in June 1960, and surveys were started immediately.

Cross sections were surveyed across the flood plain at locations selected jointly by the hydrologist and the economist. Surveys of selected floodwater-retarding structures and the stream channels were made, to provide data for preliminary design and for cost estimates. Surveys to determine storage capacity of each of the floodwater-retarding structures were made in the detail necessary for use in final structure design. Further consideration of the 51 potential sites indicated that many of them would not be suitable.

The local people had advised the planning party of the minimum reduction in flooding which would be acceptable to them, and they and the watershed planning party had agreed on the project objectives. With these objectives in



A floodwater-retarding structure nears completion.

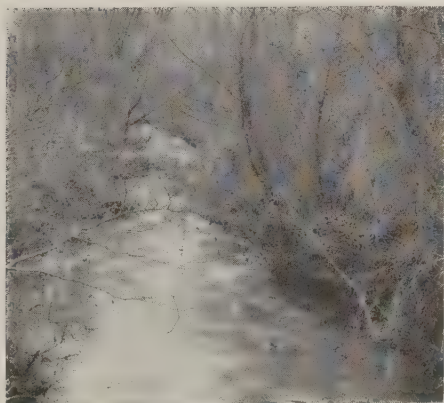
mind, the engineer, hydrologist, geologist, economist, and planning party leader selected the floodwater-retarding structure sites which, along with channel improvement, appeared most likely to provide the protection desired.

The hydrologist analyzed the effect of these structures on the depth and area of flooding to be expected from storms in the historical flood series. He advised the engineer of the size channels required to reduce flooding enough to meet project objectives. After the engineer designed these channels, an analysis of the expected reduction in flooding was com-

pleted.

The economist completed the evaluation of expected benefits, which were compared to the estimated costs and to project objectives. The results then were discussed with the local people. Adjustments, including the substitution of alternate sites and re-evaluations, were made where necessary. The upshot was that the local people and the planning party agreed to a proposed project consisting of 8 floodwater-retarding structures that will be the most effective and beneficial, and approximately 100,000 feet of channel improvement.

After any watershed work plan is approved for installation of works of improvement, the local people must obtain the necessary easements and rights-of-way for each structural measure. As soon as these are available, the State conservation engineer begins the surveys to gather the necessary data for the final design of the measures. The final design of the structures also depends on surface and sub-surface investigations, soil samples, and physical features. When these investigations and studies are completed, the dam is



A typical watershed-project channel before improvement.



The channel after clearing and snagging was completed.

ready for the final design. The construction and material specifications then are prepared.

Channel improvement may consist of clearing and snagging of the existing channel, enlarging it, or excavating a new channel. The type of any improvement included in a watershed work plan is based on the degree of protection desired and its economic justification. The method and intensity of field surveys vary with the type of im-

provement. Where new channel construction is planned, borings to determine what materials may be encountered usually are made with a power auger along the proposed centerline of the channel.

Actual construction is the test of the value of the design and plans, and must be of high quality. Because Federal money is involved, when a construction contract is awarded, a Government engineer is assigned to the job, with the re-

sponsibility to inspect all materials and determine that the construction complies with the plans and specifications. In addition to standing its share of project development costs, the local sponsoring organization is responsible for maintenance of the completed improvements. Any successful watershed project is the result of such cooperative effort of the local people and of the technical specialists and all others concerned.

NEW WATER MANAGEMENT SYSTEM Helps Louisiana Sugarcane Growers

By Larkin B. Agnew

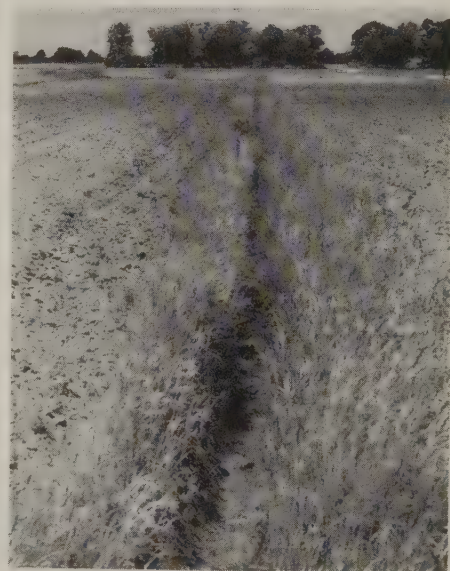
A GROWING number of progressive Louisiana sugarcane farmers are taking a second look at combined land grading and new V-type ditches as a means to better and more economical water management in their fields.

The old surface drainage pattern, that has remained unchanged since Jesuit priests established it when they introduced sugarcane into Louisiana more than 200 years ago, consists of lateral, or "split," ditches running down the slope of the land. They usually are 100 to 250 feet apart, with top widths of

3 to 4 feet, depths of 1.5 to 3 feet, and bottom widths of 1.5 to 2 feet. They drain into larger cross-ditches and thence into an outlet canal, bayou, or swamp.

Quarter drains carry water from the sugarcane rows to the split ditches. In contrast to the new-type ditches, these quarter drain ditches, excavated across the cane rows just deep enough to give drainage to the row middles, must be opened again after every cultivation; and the split ditches themselves require maintenance every few years. The split-ditch system was not a particular problem as long as cultivation was done with mules and an adequate supply of cheap hand labor was available, but farm mechanization increased the maintenance problems. Machines have been developed for cleaning out these ditches, but at considerable expense; and a large amount of weed control in the split ditches, and maintenance of quarter drains, still is done by scarce and costly hand labor.

Intensive study was given the problem of devising an improved drainage pattern, by the Agricultural Research Service and Soil Conservation Service engineers. The need was to reduce the number



The kind of split ditches eliminated by land grading.

and the linear feet of ditches to the acre, and to design another type of ditch. It was decided that a field be land graded on a trial basis, with V-type ditches installed which could be maintained and crossed with existing farm equipment.

Owner Frank H. Carruth, Jr., and Manager John C. Best of the Margaret Plantation made available a 30-acre trial plot on their farm in the Upper Delta Soil Conservation District in West Baton

Note:—The author is area engineer, Soil Conservation Service, Alexandria, La.



Type of earthmoving equipment contractors generally use for "rough" land grading.

Rouge Parish. It was a joint project of the Soil and Water Conservation Research Division of ARS, the Louisiana Agricultural Experiment Station, and the SCS. The design layout and grading were done during the summer of 1956. The research men have made careful evaluation studies each year since, and found the results encouraging enough that the practice of land grading on sugarcane land has begun to spread.

Land grading for drainage simply means shaping the land surface to planned grades determined from a grid survey. In addition to reducing the number and length of the ditches and reducing maintenance costs, low, wet areas that tend to drown out the sugarcane are eliminated. These wet spots may be natural, or they may have resulted from failure to dispose of spoil dirt from the split ditches properly, or from the method of plowing. With the elimination of the low, wet areas, more efficient production can be expected.

It has been found that land to be graded should be taken out of crops for one year, in order that the grading can be done in the summer and fall months in favorable weather. A grid survey is required, to determine planned grades, cuts and fills, and cubic yards of earth to be moved. Before the design survey is made and construction begins, fields should be free of vegetation, and they should be plowed and smoothed. It is preferable that a rain settle the ground before the survey is begun.

During the land grading, some split ditches are eliminated, the number depending upon their spacing and the size of fields economical to grade as single units. Ditches parallel to the row direction which must remain are changed to V-type lateral ditches with slopes flat enough to be maintained by mowing or with a motor grader.

Surface field ditches are built across the rows to convey row



Sugarcane on Frank Carruth, Jr.'s land-shaped and graded field in the Upper Delta SCD.

water to the V-type laterals. These surface field ditches replace the old quarter drains. Normally, 1 surface field ditch will replace 2 to 5 quarter drains. In this way, an additional 5 to 10 percent of usable farm land can be acquired by land grading.

The surface field ditches are shallow, V-type ditches with slopes flat enough for cultivating and harvesting equipment to cross. Because of frequent crossing and absence of vegetation, they need cleaning out more often than the V-type laterals.

Surface field ditches determine the number of V-type laterals needed in a graded field. Field ditches should be limited in length to drainage of 600 to 800 feet in one direction; but where a field ditch drains in both directions, V-type laterals can be as much as 1,200 to 1,600 feet apart.

Many types of earthmoving equipment are used in the grading job, including large scrapers pulled by track-type tractors and smaller scrapers pulled by wheel tractors. The first type ordinarily is used by contractors and the latter by farmers using their own

equipment. After the field is cut to the planned grade, a land plane is used to smooth the field. Three hundred to four hundred cubic yards of dirt are moved per acre, on the average, at a "turnkey job" cost of 25 to 30 cents per cubic yard.

Farmers in the Upper Delta district, which includes both the West Baton Rouge and Pointe Coupee parishes, have completed land grading on approximately 200 acres. Cooperators Ben C. Duvall, who has graded 20 acres, and M. J. Kahao, who has graded 50 acres, reflect the reaction of local landowners to the new water management system. Both stated they thought the yield resulting from the improved water management on their sugarcane land would pay for the cost of the precision land grading in 4 to 5 years.

No accurate figures are yet available generally on increase in yields as a result of land grading and V-type ditching. But all the farmers who have done this type of work have indicated they are well pleased with its reduced maintenance costs and other benefits.

The St. Anthony Falls Hydraulic Laboratory

By Fred W. Blaisdell

NUMEROUS improvements of existing designs for hydraulic structures and many new types of structures for the conservation and control of soil and water have been developed at the St. Anthony Falls Hydraulic Laboratory. The Laboratory is located at the University of Minnesota, where the Laboratory, the Minnesota Agricultural Experiment Station, and the Agricultural Research Service cooperate to solve problems for the Soil Conservation Service.

The hood inlet for pipe spillways, now used so frequently for farm ponds, was developed at this laboratory. Previously a drop-inlet spillway was the only structure available to carry the frequent small flows that drown and destroy the lining of vegetated emergency spillways.

Researchers at Oregon State College had found a way to increase the flow capacity of highway culverts by extending the roof over the entrance apron. ARS engineers at the St. Anthony Falls laboratory and an SCS engineer, M. M. Culp, saw the tremendous potentialities of the Oregon inlet. They cut a pipe on an angle of 37° and laid it with the long side on top, then placed a shield over it to form a hood over the pipe entrance. The resultant hood inlet is an old story now. Developed solely with SCS use in mind, this inlet now is being adopted by highway engineers as a culvert entrance.

The ARS research at the St.

Anthony Falls laboratory was begun in 1940 at the request of the SCS because scour had undermined the outlet end of many of the drop-inlet spillways then in use. This scour was endangering many structures. Research was needed to protect existing structures and to design new structures.

The initial work on outlets led to the development of the St. Anthony Falls stilling basin for use at the exit of culverts, chutes, and dams. The SAF stilling basin has chute blocks at the entrance of the basin to break the entering stream into a number of jets, floor blocks to create turbulence that will use up the destructive energy of the

flow before it is discharged into the stream channel, and an end sill to direct the bottom currents upward away from the streambed and thus prevent scour damage to the bed.

Although the SAF stilling basin is used for some of the smaller structures where the soil is very erodible, it is used primarily for flood prevention dams built by SCS. The first non-experimental SAF stilling basin was built by SCS in Crawford County, Iowa. It has since been used extensively by other Federal and State agencies, both in the United States and in foreign countries.

The facilities of the St. Anthony Falls Hydraulic Laboratory are



The St. Anthony Falls Hydraulic Laboratory and surrounding area.

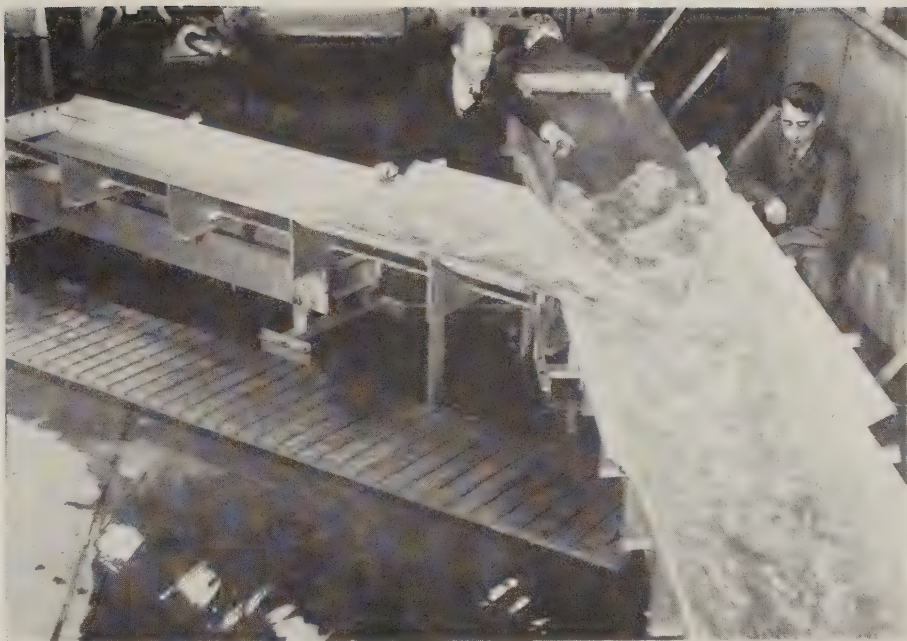
Note:—The author is hydraulic engineer, Agricultural Research Service, Minneapolis, Minn.

well adapted to the type of research being conducted there. The laboratory is located on Hennepin Island at the St. Anthony Falls in the heart of Minneapolis. The Mississippi River has a fall of 50 feet at the laboratory site, and this entire fall is available for laboratory experiments. Water for most of the experiments is diverted from the Mississippi River above the falls and is returned to the river below the falls.

The Minnesota State Legislature granted the University of Minnesota and the Laboratory the right to draw three millpower—the water required to operate three flour mills—continuously from the river at any time. This amounts to about 40 cubic feet per second; but the Laboratory is designed to use 300 cubic feet per second when this amount of water is available and is needed.

The laboratory building is six stories high. Built into the falls as it is, four of the stories are below the upstream level of the river. As a result, gravity flow of water is available throughout most of the laboratory. The upper levels are used for offices.

An unique feature of the physical plant is a pair of large volumetric tanks located outside the laboratory. Water from many of the experiments can be diverted into these tanks and measured continuously with an accuracy of better



Flow conditions at junction of concrete lined ditches on Whiting Field Naval Air Station are simulated for testing at the St. Anthony Falls Laboratory.

than one-fourth of one percent. Similar tanks on scales are located inside the laboratory and are available for measuring flows up to about 10 cubic feet per second. When especially precise work is necessary, the means are available to accomplish it!

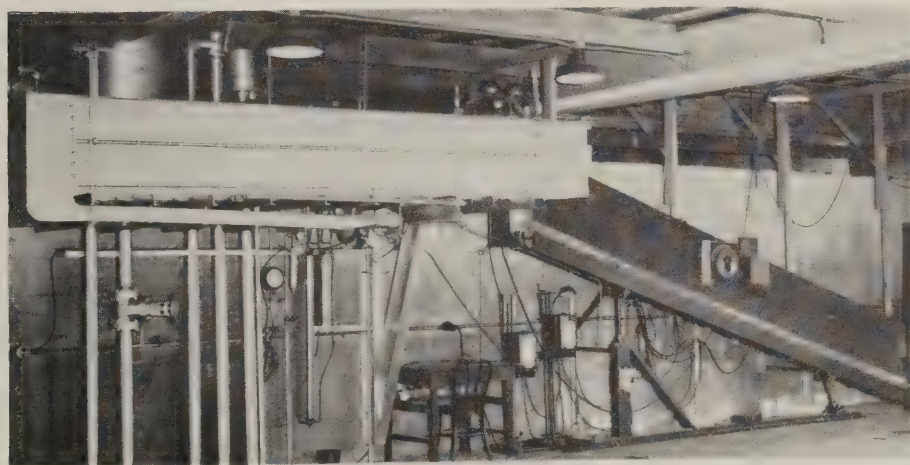
The opportunity to consult with other experts when special problems arise contributes much to the efficiency of laboratory operations. A staff of specialists in erosion, sediment transportation, pipe hydraulics, hydraulic machinery, theoretical hydraulics, model operation, etc., is always available for

consultation at the St. Anthony Falls laboratory, an asset equal to the excellent physical plant. Technicians and skilled mechanical help are also available to the ARS researchers as they are needed.

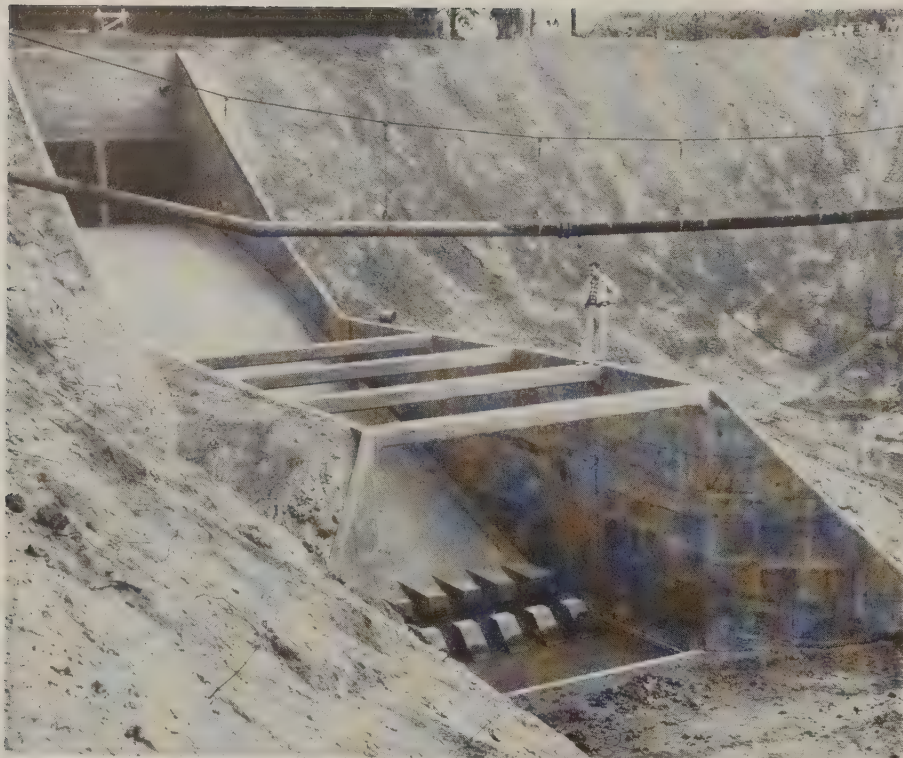
One of the research jobs recently completed was a study of the hydraulic energy losses at junctions of agricultural drain tile.

Formerly it was thought necessary to join a lateral drain line to the main line at a flat angle in order to reduce the loss of energy caused by the junction. This flat junction angle frequently required a hand-fitted curve in the lateral near the junction. Chipping the tile to form the curve and the hand digging required to shape the ditch were time consuming and expensive. The research on the hydraulics of agricultural drain tile junctions shows that all this handwork is unnecessary. The results obtained indicate that the best angle to use to join a lateral to a main is the most convenient angle, whether it be 30°, 45°, or 90°.

Another interesting study at the laboratory was the development of a new outlet for a straight drop spillway where scour endangers the outlet. During the course of the



Apparatus used for testing pipe spillways at St. Anthony Falls laboratory.



Earthen dam, box culvert, chute, and SAF stilling basin for a floodwater retarding structure that has a county road crossing the dam in Ventura County, Calif.

study, it was discovered that tailwater levels higher than normal cause excessive scour downstream from the stilling basin. This was a surprising finding, because it was contrary to the widely accepted idea that less scour occurred when the tailwater level was high. Research discovered the "why" of this unexpected phenomenon and developed design rules that prevent the occurrence of damaging scour in field structures. Experience with this new straight drop spillway stilling basin in the erodible sandy soils of northern Florida has verified the efficiency and satisfactory performance predicted by the laboratory models.

No. 63

This is the sixty-third of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

Twenty years ago, when the ARS group first started work on drop-inlet spillways, the hydraulics of closed conduit (pipe) spillways was not understood. The pipe spillway is a simple structure, but its hydraulic performance is very complicated.

ARS research developed a theory of the hydraulics of closed-conduit spillways. The theoretical studies have shown how the laws of hydraulics are applied to the design of closed-conduit spillways, both in the laboratory and in the field.

Model studies conducted on a large number of shapes of drop inlets have developed many useful design criteria. The model studies have also shown how the spillway will perform and have helped answer such questions as: Will the barrel flow full, as it should for maximum efficiency? Will the head-discharge curve show a single value for each head, or will several values of discharge occur at certain heads to make impossible the determination of the flow at any instant?

These and other questions must be answered satisfactorily before a particular form of closed-conduit spillway can be recommended for use by the SCS in connection with farm ponds or flood detention reservoirs. The laboratory work must be done carefully, because a single recommendation affects hundreds of field structures.

A two-way drop inlet with a flat anti-vortex plate is now receiving ARS attention at the St. Anthony Falls laboratory. Information on this type of structure is given highest priority by the SCS, because it is being used extensively in connection with watershed protection and flood prevention activities.

Occasionally, model studies of specific streams or structures are undertaken. A good example was the design of the drainage system at a Naval Auxiliary Air Station at Milton, Fla. The resultant soil conservation structures prevented the destruction of an airfield worth many millions of dollars.

Problems encountered and solved by the use of model structures include entrances for concrete-lined ditches, high-velocity ditch exit structures, the joining together of streams flowing at high velocities, the joining of low-velocity streams to high-velocity streams, and grade-control structures for earth ditches.

An idea of the necessity of model studies can be obtained from a single illustration. At one junction of a high-velocity stream with a low-velocity terrace outlet channel, the model studies showed that waves would overtop the original channel sidewalls by four feet. A new junction design was developed to insure that the flow could be contained within the channel walls.

These are a few of the ways in which the Agricultural Research Service hydraulic engineers at the St. Anthony Falls Hydraulic Laboratory in Minneapolis are helping to solve some of the problems confronting the Soil Conservation Service.

Terrace Club Gets Results

By Martin Max Hawk

THE Grundy County Terrace Club is believed to be the first of its kind in the United States. Organized in 1950 by 21 farmers cooperating with the Grundy Soil Conservation District in northeastern Iowa, it has continued to grow in membership and effectiveness during the ensuing decade. Terracing, for example, has doubled as a result of the club's activities.

To be eligible for membership, a farmer must have terraces on his farm. The farmers attending the first meeting were presented special charter-membership plaques by the district. Members enrolled since have been given framed membership certificates by the club.

"The terrace club has helped me by my association with other conservation farmers who are coping with the same problems I have encountered in building and farming terraces," says Gordon Davidson, an outstanding conservation farmer and first president of the club. "The gain over the years far outweighs the difficulties. We should use all the aids available to make the installation and farming of terraces easier."

Willard Dielschneider, another club member and district cooperator, says: "The club gives us a chance to talk over terrace problems with others who have the same difficulties. It gives us a chance to compare notes, so to speak."

Assisting Soil Conservation Service engineers and other technicians are enthusiastic about the terrace club, because it promotes conservation and helps get more terraces on the land. As area con-

servationist J. Ross Oliver points out, "The club has added something which sets a terrace farmer apart, because each member feels he is a veteran in a very special way. Farmers just starting a conservation program come as guests to the club meetings; they leave with a strong desire to be part of the club."

The terrace club, which elects officers each year, is self supporting through contributions from members, profits from dinners, and other sources. It finances the purchase of membership certificates, and awards for such conservation activities as speech contests, essay contests, and school conservation projects. It sponsors terrace demonstrations, terrace-building contests, and other activities for the promotion of the terrace program in the district.

The club's big event is its annual banquet. Each member brings his wife, and at least one prospective member and wife, as guests. There is a well-rounded program, high-

lighted by a discussion panel of at least two club members, a soil conservation district commissioner, and a Soil Conservation Service representative. Through this panel, members and guests present problems for discussion. Speakers have included the governor of Iowa and members of the Iowa State University staff.

Terrace club members practice what they preach. Take Byron Johnson, for example.

"By terracing and keeping the fertilizer on the hill where it belongs," he says, "I harvested 3,000 more bushels of corn from 74 acres than was ever harvested before, and I have the records to prove it."

Dubious at first, Johnson was persuaded by club members to terrace his farm.

SCS technicians believe the terrace club has increased the application of terraces on the land in the Grundy district by at least 100 percent, including the new cut-and-fill parallel terraces.



First Terrace Club officers, left to right (front row): Pres. Gordon Davidson, Grundy Center; Dist. Commissr. James F. Petersen, Dike; (back row) Secy. Lester Rittgers, Cedar Falls; Dist. Commissr. Ralph Schildroth, Reinbeck; Dist. Commissr. W. R. Mitchell, Grundy Center; Vice Pres. Luther Brindle, Whitten.

Note:—The author is work unit conservationist, Soil Conservation Service, Grundy Center, Iowa.

Soil Mechanics

In Soil and Water Conservation

By Rey S. Decker

THE fact that soil as a prime construction or foundation material is used in more soil and water conservation engineering projects than is any other building material means that soil-mechanics tests and analyses are needed in developing most such projects.

For engineering purposes, soil may consist of any mixture of particles ranging in size from the finest clay to cobbles and boulders. A natural soil deposit may be used in place as support for a structure, or it may be excavated, reworked, and compacted into an earth dam. Variable factors such as those related to composition, depth, geologic origin, and the history and proposed use of soils all affect their behavior characteristics.



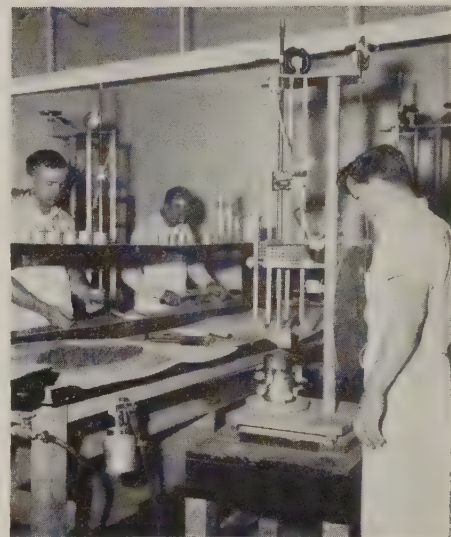
Consolidation apparatus for finding soil compressibility.

To be used by design and construction engineers, these characteristics must be interpreted in terms of specific values of strength, compressibility, water conduction, bearing capacity, compactibility, and related physical and structural properties. The soil-mechanics and soil-engineering investigations and analyses, dating from about 1925, provide the data necessary to predict how a given mass of soil beneath or in a structure will react under different conditions and functional requirements.

The engineering properties of soils must be evaluated for the safe, yet economical, design of such projects as earth dams, concrete or masonry dams founded on soil, irrigation and drainage canals, flood-control levees and dikes, stream-channel rehabilitation, and sealing leaky reservoirs and ponds.

Soil also is the most variable material involved in the engineering projects. The composition and properties of soils often change with depth and within small areas, because of their varied formation and geologic origin. All have different physical characteristics and engineering properties; but for most projects the soil must be used as it occurs on a given site, and the evaluation of its properties and the determination of adequate design values are difficult and complex.

Site investigations for preliminary evaluation of soil characteristics and collection of samples are made by Soil Conservation Service field geologists and engineers. Undisturbed core samples of foundation materials, bag samples of



Compaction test by machine method.

material to be excavated or used for construction, and all pertinent data are sent for testing and evaluation to the Service's Soil Mechanics Laboratory at Lincoln, Nebr., or to testing sections in Portland, Oreg., Fort Worth, Tex., and Spartanburg, S. C.

Standard index and classification tests are run on most samples. These tests include particle-size distribution by sieve and hydrometer analyses and Atterberg limit tests. These tests form the basis for classifying soils by the Unified Soil Classification System. Other index tests on selected samples include specific gravity, soluble salt content, and dispersion ratio. Unit weight and moisture determinations are made on all undisturbed samples. The index tests provide a basis for general characterization of variations in materials and properties of all the samples, and

Note:—The author is head, Soil Mechanics Laboratory, Soil Conservation Service, Lincoln, Nebr.

for correlating field classification and geologic descriptions.

Moisture-density or compaction tests are performed on materials to be placed in embankments and backfills, to provide a soil-density standard for additional tests and for construction control.

Complex tests are run on selected samples to determine specific engineering values which are considered necessary for the solution of design or construction problems at a specific site. These complex tests may include: Permeability tests on undisturbed foundation or compacted material, to determine the rate at which water moves through the soil; consolidation tests, to provide information for estimating the vertical movement



(Foreground) Atterberg soil-plasticity test; (background) hydrometer method for determining soil grain size.

or compression in an embankment or foundation and the horizontal movement in plastic foundations under dams; and shear tests, to determine the strength of embankment, backfill, and foundation

materials.

Other laboratory tests also are made to meet special problems. Test and other information on a specific site is evaluated and analyzed, and included in reports making recommendations covering the soil-engineering aspects of the project.

During the 1959-60 fiscal year, 7,450 samples from about 470 projects were processed in the Lincoln laboratory and approximately 3,200 samples from nearly 350 sites were processed in the three testing sections, for a total of approximately 10,650 samples from more than 800 projects in 37 States and Puerto Rico. About 90 percent were flood-prevention and watershed-protection structures.

Hydrologists Keep Track of the Water

By R. G. Andrews

How water affects soil and water conservation work from the time precipitation falls as rain or snow until it returns to the atmosphere in the completed hydrological cycle is a matter of primary concern in farm and watershed conservation planning.

Dependable answers to water behavior and effects are of basic importance in locating and designing floodwater-retention structures in small watersheds, and in predetermining the water management aspects of various other conservation measures on farms and ranches. Soil Conservation Service hydrologists supply those answers to small-watershed organizations, farmer-organized and farmer-operated Soil Conservation Districts, and others with whom the Service is assigned responsibility to work in

land use and water management improvement.

Hydrologic studies, like soil surveys and geological investigations, precede and are basic to sound planning of conservation structures and other works of improvement. They all directly help communities and group or individual landowners to avoid hit-or-miss project undertakings that otherwise might turn out to be unsatisfactory and costly.

Many of the latest concepts and theories of hydrology have resulted from interest in the effects of soil conservation land treatment and water management programs. The data collected by the soil conservation research stations (later transferred to the Agricultural Research Service) were used by the hydrologists to improve the tools of soil and water conservation and to develop new ones. Although many of these tools used today by

conservation engineers and other conservation technicians are in the form of simplified charts, tables, maps, and graphs, they are based on extensive hydrologic data and computations.

The steadily increasing number of local-State-Federal flood prevention and watershed protection projects has greatly increased the demand for hydrologic information. SCS hydrologists are called upon to compute from meteorologic and watershed data a complete flood history of the watershed, including such pertinent facts as acreages subject to flooding. They also calculate acreages on which flooding would have been prevented if floodwater-retarding structures or channel work had been in place. Based on these findings, and the estimated cost of the structural measures, it is decided whether the proposed program is justified.

Note:—The author is head, Central Technical Unit, Soil Conservation Service, Beltsville, Md.



Engineering Aid Bill Thomas reads rain gage, one source of hydrologic data, near a damsite in Upper Hocking pilot watershed project in Fairfield SCD, Larcaster, Ohio.

The hydrologic design of flood-water-retarding structures requires, for example, that the detention storage capacity and flood-water-release rates be properly proportioned, so that the emergency spillway is not subject to destructive erosion. On the other hand, the release rates must not be so great that a large number of structures releasing water simultaneously will cause prolonged flooding or swamping of areas adjacent to stream channels.

The relationship between the detention storage, the maximum storage to the top of the dam (surcharge storage), and the capacity of the emergency spillway must be such that the runoff from the largest storm that can reasonably be expected in the area will not cause failure of the structure. These pieces must be fitted together like those of a jigsaw puzzle, to make sure that the floodwater-retarding structure will be built for the least amount of money and located at a site that will produce

the most benefits.

If the storage of domestic or irrigation water is involved, the hydrologic problems that must be solved increase. The SCS currently is cooperating in the work of the U.S. river basin study commissions and river compact commissions, in municipal and irrigation water supply studies, and in other undertakings in this important field.

A question often asked is: "What effect will the land treatment, flood prevention, and watershed protection programs have on

the available supply of water for downstream use at some specific date in the future?"

Preliminary studies indicate that there is no apparent reduction in downstream water yield as a result of this work, but a precise answer to a question of such broad import must await still more extensive soil and water conservation application than that which has been accomplished so far. Meanwhile, hydrologic investigations continue to be basic in the technology that is helping to conserve the Nation's soil and water resources.

Bulbs Can't Stand Wet Feet

By Andrew Linn

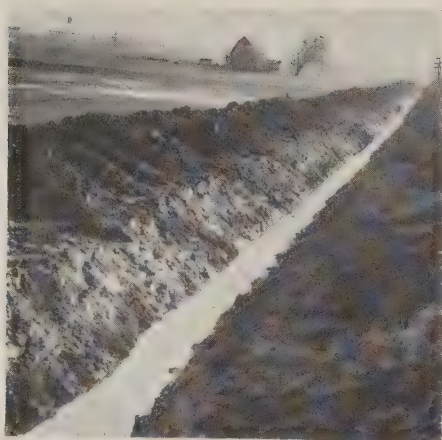
DOES improved drainage pay in dollars and cents? "Yes," says Harold Knutson, well-known bulb grower in western Washington's Puyallup Valley.

While looking over a field of

bulbs near his house where a complete tile drainage system was installed last year, he commented: "I lost 4 acres of bulbs in this 14-acre field one year because they drowned out."



Knutson, left, and Alfred Scholz in field of daffodils.



Ditch that will provide tile-drain outlet for Knutson's and four other farms.

Four acres of bulbs doesn't mean a few dollars, but thousands of dollars. The cost of certain planting stock can run from \$1,000 to \$1,500 an acre. This figure does not include preparing the ground, labor, fertilizing, and the other costs of getting an acre of ground into production.

Knutson farms 600 acres in the fertile valley near Sumner and Puyallup. Most of his efforts go into the production of iris, tulip, and daffodil bulbs. He also produces rhubarb and raises beef cattle.

He is a cooperator with the Pierce County Soil Conservation District. In the past 2 years, he has installed, with the technical help of the Soil Conservation Service, 7,800 lineal feet of tile, which has benefited 51 acres of valuable bulb land.

Up to the time the Pierce County district was formed in July 1949, there was little tile drainage in the Puyallup Valley. Now, farmers are realizing the importance of good drainage on their bulb and other cropland and are installing more tile systems each year. The Agricultural Stabilization and Conservation Committee usually shares up to half the cost of this permanent conservation practice, and the SCS is respons-

ible for the technical phases.

Experience in an area and basic design criteria enable the technician to determine the diameter, depth, and spacing of a tile system. For example, a sandy soil will allow water to filter through easier and faster than a clay soil, thus allowing wider spacing between the lines. A tile line must have a minimum cover adequate to protect it from heavy machinery and tillage operations. Shavings, sawdust, or wood chips are filled in the trench 10 to 12 inches above the top of the tile, and soil is then back-filled over the filter material.

SCS technicians stake, survey, and design the drainage system. When the contractor moves in, he is given the grades and cuts of all the tile lines to be installed in the field. The technicians also check the installation as the drain is laid, and, when the installation is complete, take compass bearings to describe the lines. A map of the installation is made and becomes a part of the landowner's conservation farm plan, so he can locate his tile lines in years to come with such simple tools as a compass and tape measure.

In Pierce County, the completely installed cost of a 6-inch tile line averages 60¢ a lineal foot. The quality of tile used in such a permanent installation must meet



Laying tile in freshly dug trench.



An improved 14-acre bulb field after heavy rains with no water damage.

definite specifications. Cost of tile drainage can range from \$50 to \$250 an acre, depending upon the field conditions.

Knutson, finding himself in need of new bulb ground, recently located a farm which, because of poor drainage, was used for some pasture and shallow-rooted vegetables. After consulting the SCS on its drainage improvement possibilities, he bought the place and is starting drainage improvement as part of his conservation program that will enable him to grow bulbs successfully. In order to do this, he needed a large ditch which would outlet through five farms. The arrangement was worked out through cooperation with his neighbors and the ASC office in a pooling agreement. Next year, he will start installing a system of tile feeder lines to the main drain ditch.

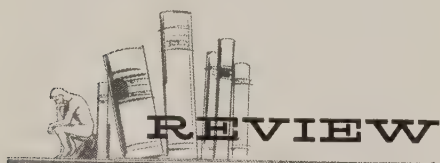
When asked what this improved water management means on this farm in dollars and cents, Knutson said: "Bulbs were tried on this place several years ago and the farmer lost heavily. Without this ditch the place is worthless."

◆
"Land Use in a Changing Agriculture" is the theme of the 16th annual meeting of the Soil Conservation Society of America at Purdue University, Lafayette, Ind., July 30-August 2, 1961.

◆
National Farm Safety Week is being observed July 23-29, 1961.

Note:—The author is agricultural engineer, Soil Conservation Service, Snohomish, Wash.

If your address changes, please notify us of your complete new address, including zone or RFD number, and include old address with our code number as shown above.



LAND, WATER & PEOPLE—A HISTORY OF THE NATIONAL ASSOCIATION OF SOIL CONSERVATION DISTRICTS. By Otis Tossett, assisted by Joe Douthit. 143 pp. Illus. 1961. The Soil Conservation Districts Foundation, Inc.: League City, Tex. \$3.

Two active participants in the nearly 25-year-old nationwide soil conservation districts program record key steps in "the history of a movement and an organization which plays a vital role in proper land use." In 10 chapters, the author sketches the development and operation of the National Association of Soil Conservation Districts and its Women's Auxiliary. The description of events is sufficiently complete to provide an understanding of what happened, the leading participants, and the underlying causes for organization of the NASCD. A 62-page appendix includes a statement of the objectives and policies of the Association, the cover and signatures on the organization's first constitution, a list of officers by years, and the programs of the 14 annual conventions from 1947 to 1960.

The primary job of the NASCD

in helping individual districts increase their usefulness is described in categories including information and educational help and the "Program for Greater Service."

Several programs the national association has helped to develop are described. They include: Soil Stewardship Week, the Goodyear Contest on district operations, the Farm Equipment Dealer-District Program, land judging contests, the 4-H conservation program, conservation education with Boy Scouts, District newsletter contests, and others.

Special recognition is given to the late E. C. McArthur, first president of NASCD, the late President Waters S. Davis, Jr., and the late Dr. Hugh H. Bennett, first chief of the Soil Conservation Service.

One chapter, on "District Organization Summary," reviews the development of the model act which served as a basis for enactment of State soil conservation district laws between 1937 and 1947. Another chapter, on "Conservation Battlegrounds," describes several major issues relating to progress in conservation in which the work of the Association was the deciding factor.

This work should be useful to all who are interested in this subject vitally significant to our Nation's welfare, even though some events and leaders were overlooked or not known about by the author.

For an understanding of key

happenings in the development of soil conservation districts, and key events and leaders in the evolution of the NASCD as the spokesman of progressive soil and water conservation farmers and ranchers throughout the Nation, this book should be of use not only to soil conservation district supervisors, directors, or commissioners, but to everyone concerned with soil and water conservation.

—T. L. GASTON

Have You Seen?...

• *Better Hunting and Fishing on Small Watershed Projects*, published by the Fish and Wildlife Service, with photographs and other material from the Soil Conservation Service. It explains how developments benefiting fish and wildlife can be incorporated into the planning of a small watershed project, and what Federal aid is available.

• *Conservation Help for Builders, Developers, and Contractors*, a new booklet prepared by the Virginia Association of Soil Conservation Districts. It describes the kinds of help available to builders from Virginia soil conservation districts, relates problems that may be encountered without conservation help, and gives some "ground rules" for builders to follow in eliminating those problems.



